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OF
OPHTHALMOLOGY

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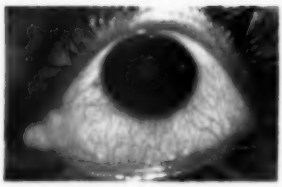

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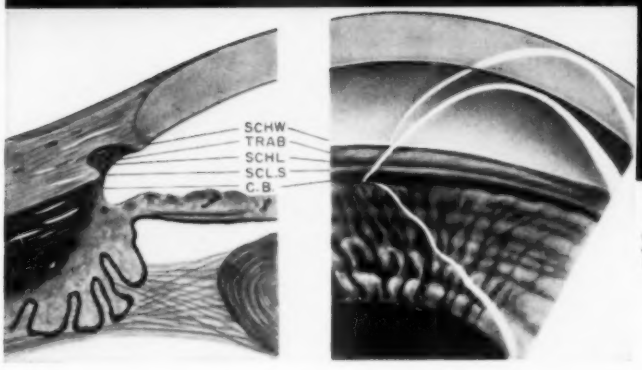

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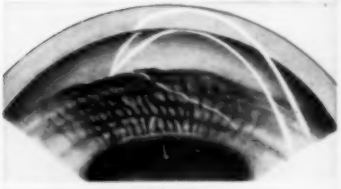

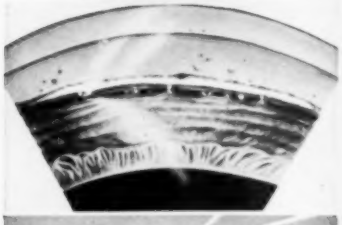

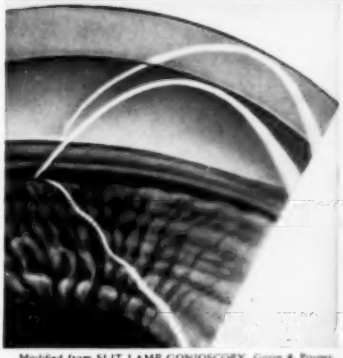

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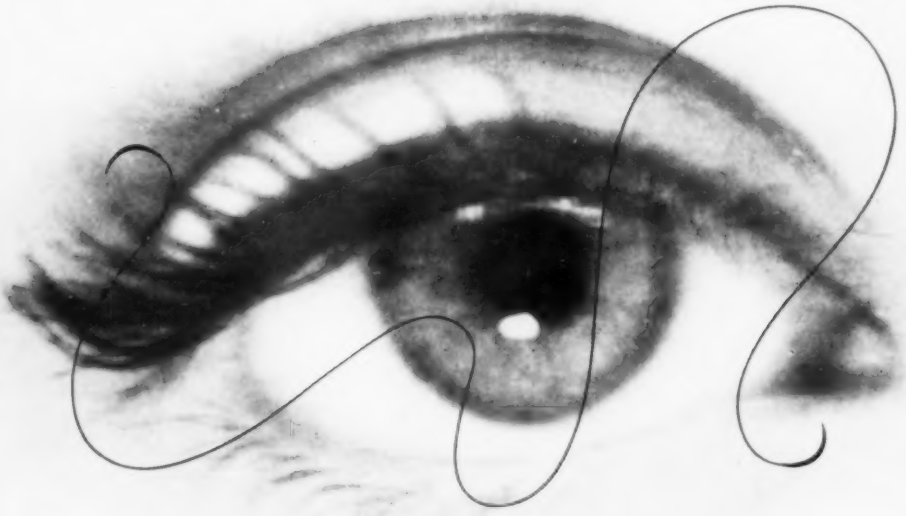

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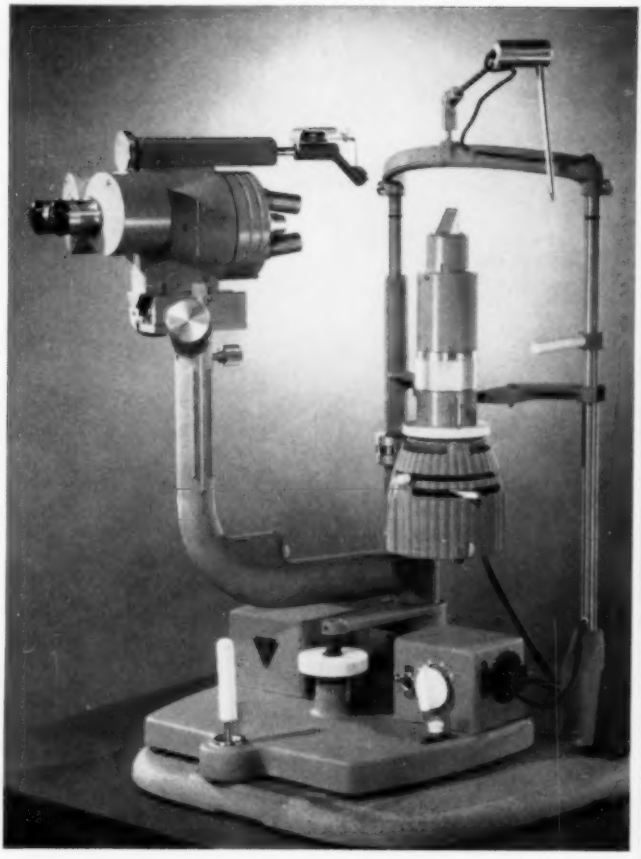

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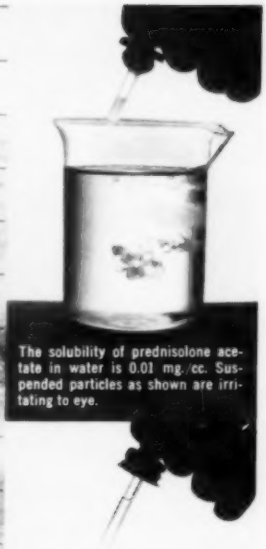

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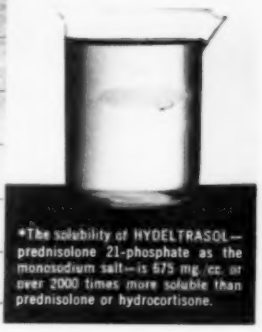

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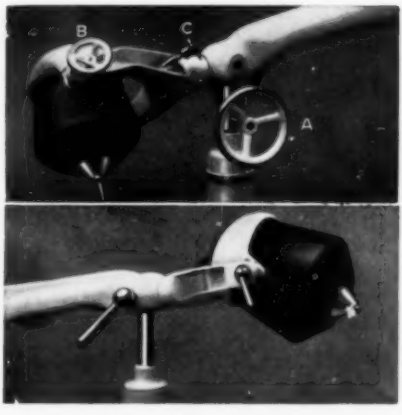

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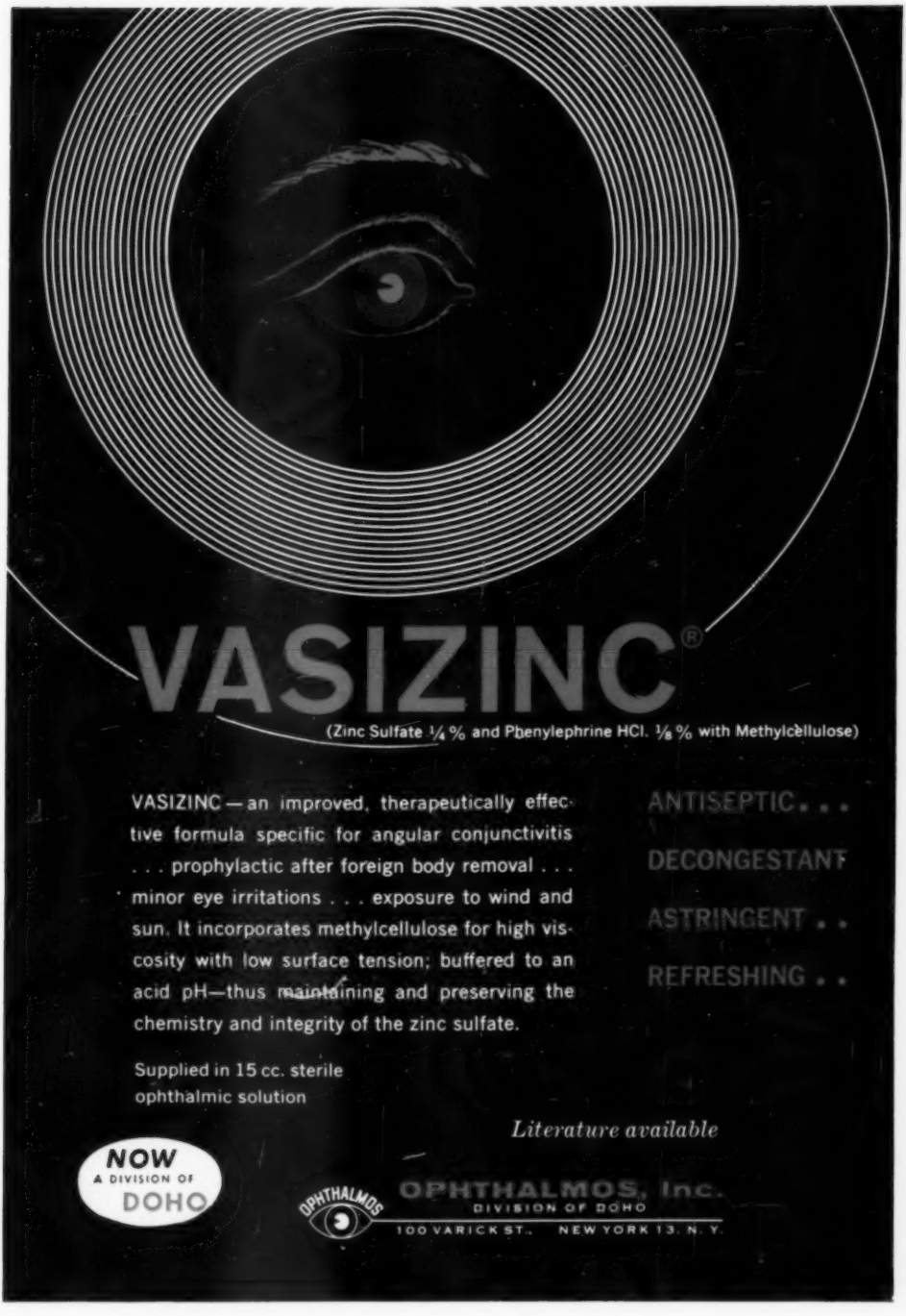
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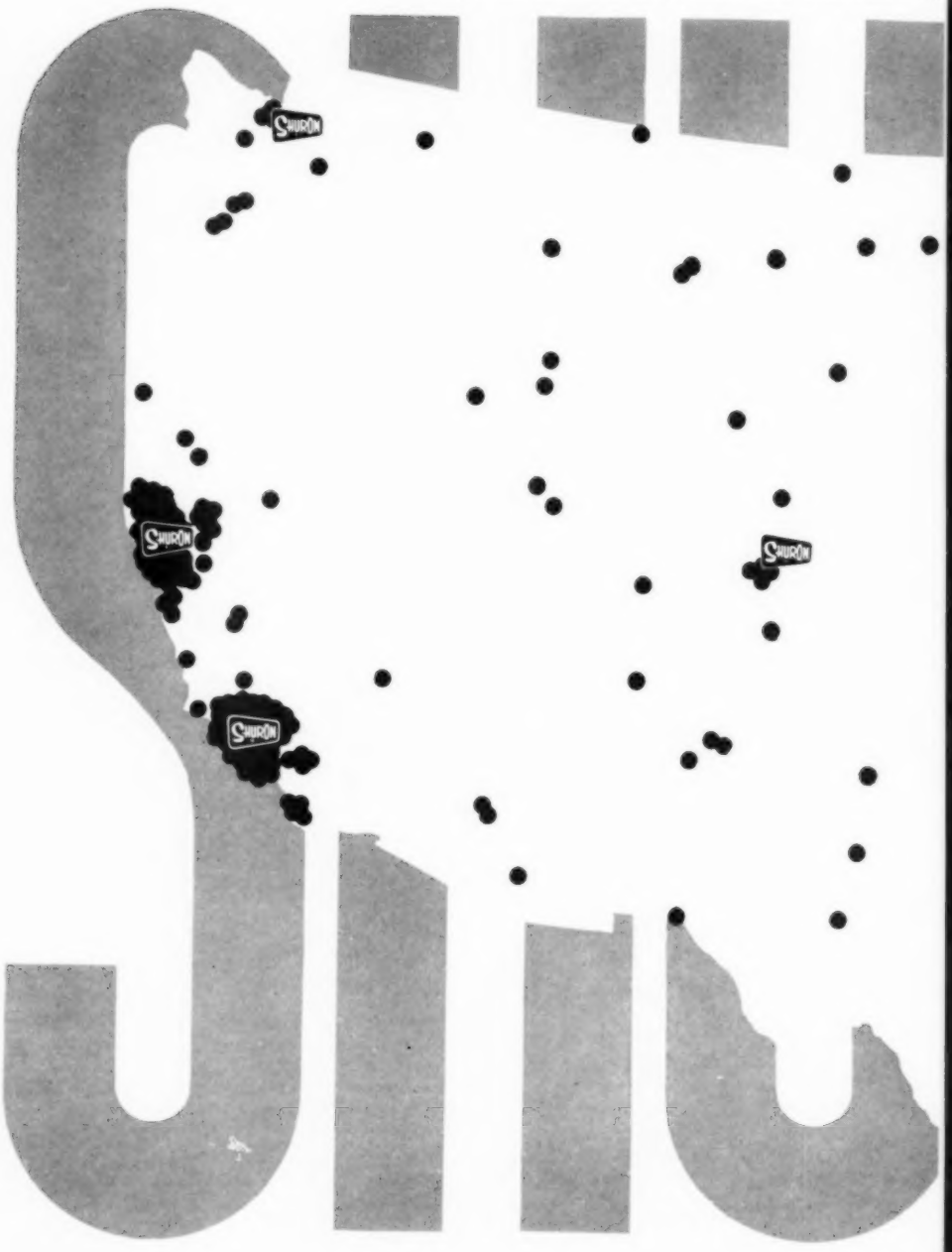

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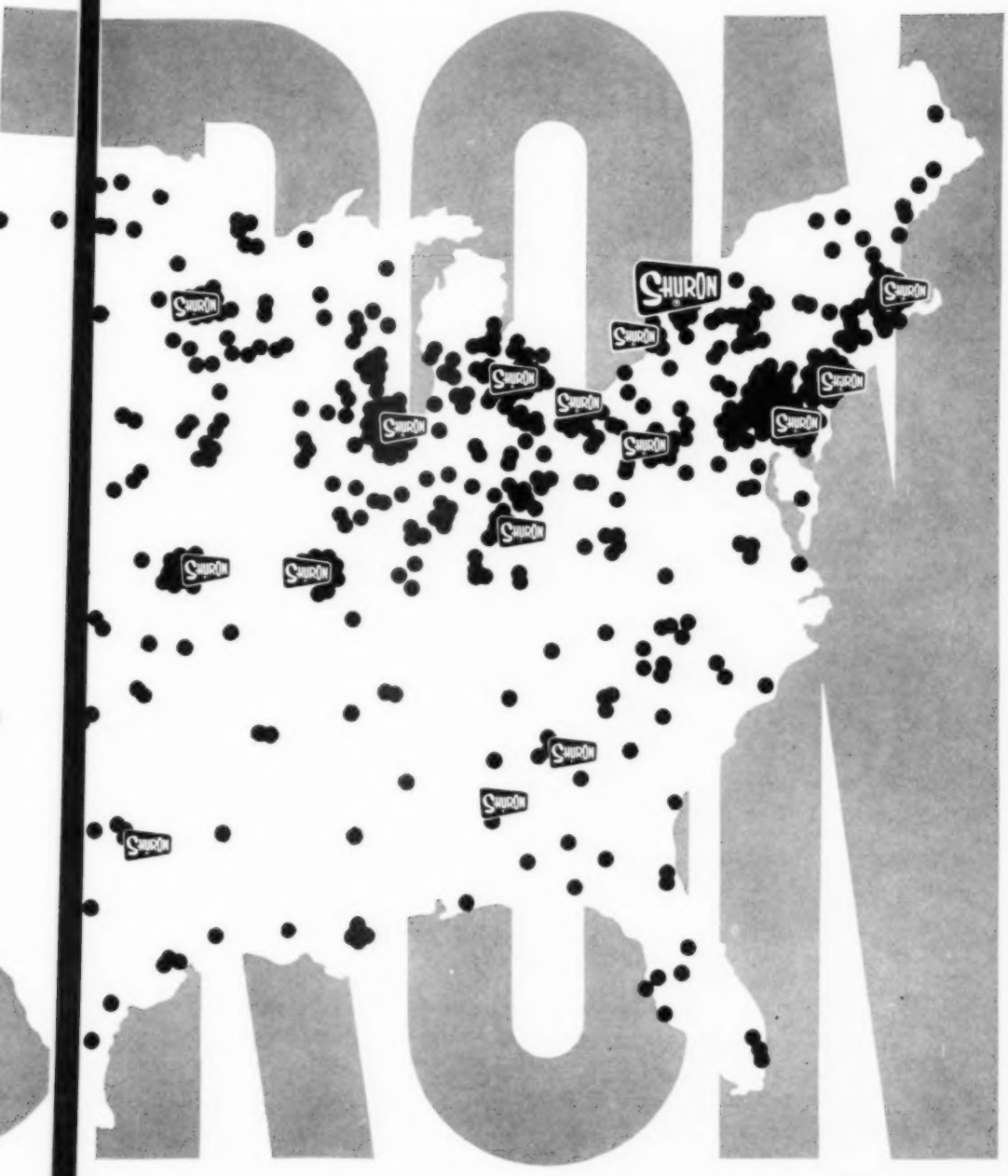
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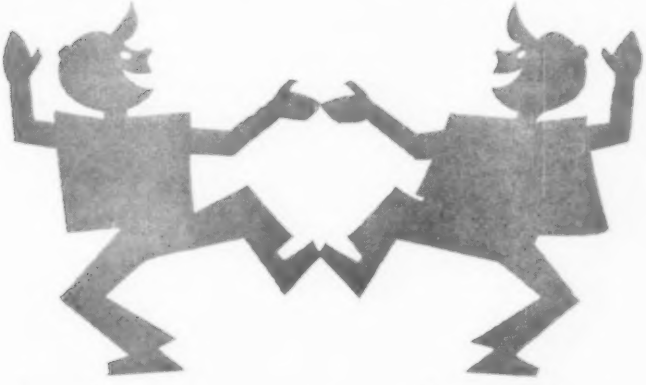

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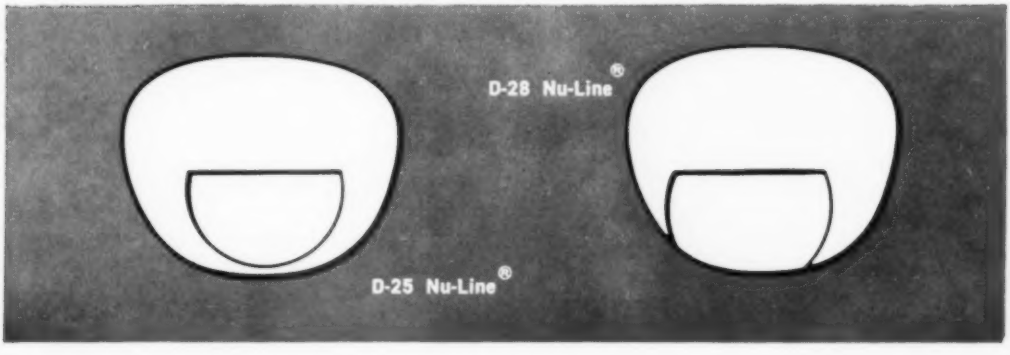

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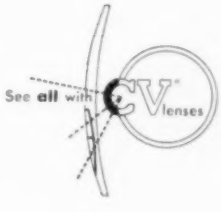

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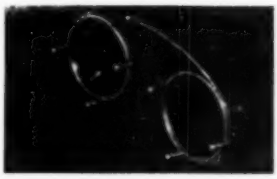

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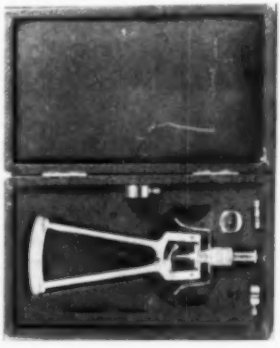

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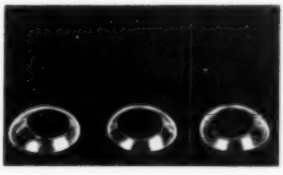

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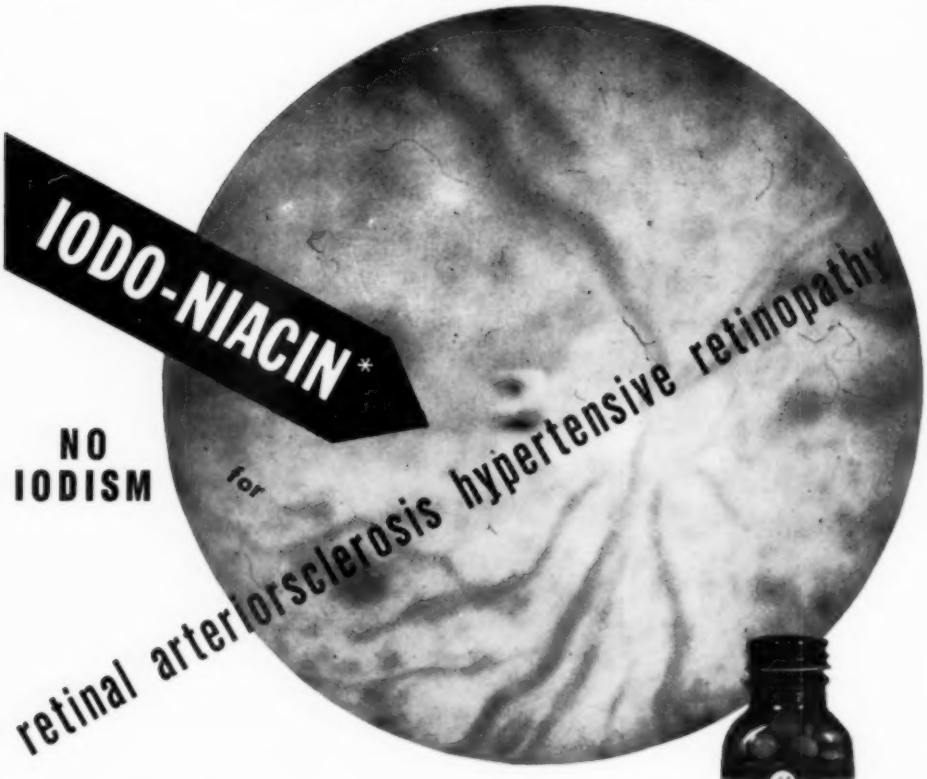

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1. *Cecil's Textbook of Medicine*, 7th ed., 1947, p. 1287.
2. *Ibid.*, p. 1598.
3. *Am. J. Ophth.* 42:771, 1956.
4. *Am. J. Digest. Dis.* 22:5, 1955.
5. *Med. Times* 84:741, 1956.

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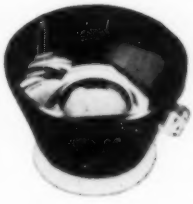

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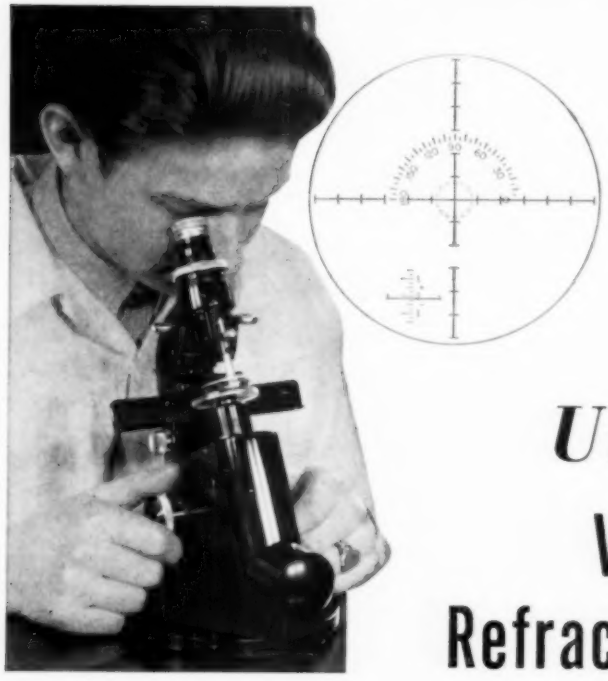

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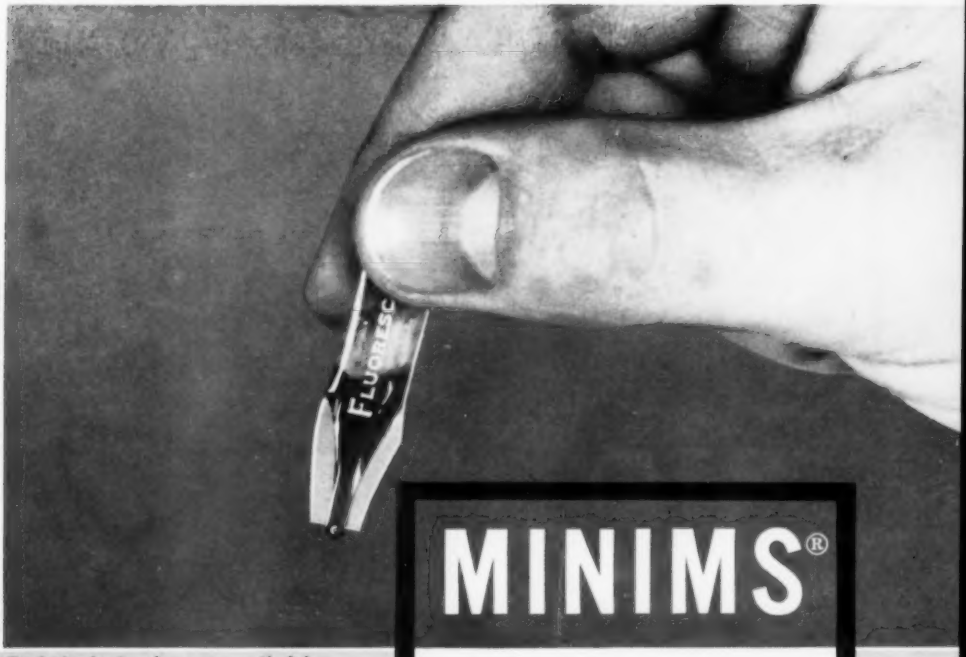

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ABSTRACTS

Anatomy, embryology, and comparative ophthalmology; General pathology, bacteriology, immunology; Vegetative physiology, biochemistry, pharmacology, toxicology; Physiologic optics, refraction, color vision; Diagnosis and therapy; Ocular motility; Conjunctiva, cornea, sclera; Uvea, sympathetic disease, aqueous; Glaucoma and ocular tension; Crystalline lens; Retina and vitreous; Optic nerve and chiasm; Neuro-ophthalmology; Eyeball, orbit, sinuses; Eyelids, lacrimal apparatus; Tumors; Injuries; Systemic disease and parasites; Congenital deformities, heredity; Hygiene, sociology, education, and history .. 748

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VOLUME 45 MAY, 1958 NUMBER 5

THE OCULAR LESIONS OF TEMPORAL ARTERITIS*

HENRY P. WAGENER, M.D., AND ROBERT W. HOLLENHORST, M.D.
Rochester, Minnesota

The subject of temporal arteritis was first brought to the attention of the American Ophthalmological Society by Post and Sanders[1] in 1943. The diagnosis in the case that they reported had been confirmed by biopsy of a temporal artery in 1935. The ocular fundi were said to have been normal at that time. The retinal lesions described by Post and Sanders were not observed until 1941. The authors stated that the exact nature of the localized arterial lesions presented a problem in interpretation, that they seemed not to be directly related to the lesions in the temporal arteries, and that they could be explained possibly on the basis of the patient's arteriosclerosis and hypertension.

At the 1949 meeting of the Society, Bruce[2] reported a case of bilateral blindness associated with temporal arteritis. The diagnosis was not confirmed by biopsy in this case, but clinically the ocular lesions and the systemic manifestations were typical of this disease. Bruce's paper was discussed at the same meeting by Braley, by Post, by McGuire, and by Duggan, each of whom reported one case, and also by Anderson, who reported four cases, and by MacLean, who made two very interesting remarks which will be referred to later.

In his discussion of the literature on temporal arteritis, Bruce mentioned a review which one of us (Wagener[3]) had written in 1946. In this review, it was suggested that the lesions which had been observed ophthalmoscopically in cases of temporal arteritis up to that time might be classified into three groups: closures (thromboses) of the central artery of the retina or of branch arterioles, of which there had been three cases; ischemic optic neuritis, seven cases; and indeterminate, nine cases. Two of the cases in this last group were probably instances of ischemic retinopathy, which is recognized now to be one of the manifestations of temporal arteritis. But, it was stated that in five of the cases, "the evidence of direct connection with the temporal arteritis is not convincing." Bruce adopted this method in classifying the ocular lesions which had been observed in his own case and in 33 of 83 cases of temporal arteritis which he had collected from the literature. He placed six cases in the arterial occlusion group, 13 in the ischemic retrobulbar neuritis group (including his own), and 15 in the indeterminate group.

As more cases of temporal arteritis have been studied and as case reports have accumulated in the literature, there has evolved a rather clear-cut picture of the characteristic ocular lesions of this systemic disease. And it has become evident that most of the lesions placed in the indeterminate or miscellaneous group are not an integral part of temporal arteritis but are associated with it only by their chance occurrence in the same elderly individual. The basic lesion which accounts for the ocular involvements of temporal arteritis is a progressively occlusive process

* From the Section of Ophthalmology, the Mayo Clinic and Mayo Foundation. The Mayo Foundation is a part of the Graduate School of the University of Minnesota. This paper was presented at the 93rd annual meeting of the American Ophthalmological Society, Hot Springs, Virginia, June, 1957, and will be published in the *Transactions* of the American Ophthalmological Society. It is printed here with permission of the society and of the Columbia University Press, New York.

which affects the ophthalmic or central retinal artery, or perhaps the central artery of the optic nerve, as suggested by François, Verriest, and Baron,[4] and causes most frequently ischemia or ischemic infarction of the optic nerve and less often ischemia of the ocular muscles or of the retina alone, and which only rarely is located sufficiently close to the globe to produce the characteristic ophthalmoscopic picture of occlusion of the central artery of the retina.

Data on the present series

To the end of the year 1956, 122 cases of temporal arteritis had been studied at the Mayo Clinic. The diagnosis was confirmed by biopsy of a temporal artery in 72 and of an occipital artery in two of this group. In addition, seven cases were observed in which temporal arteritis was suspected on the basis of seemingly sufficient, though somewhat atypical, clinical findings but in which biopsy of a temporal artery failed to reveal characteristic histologic lesions. The eyes were not involved in four of these cases; among the other three cases, occlusion of a central retinal artery was present in one case, episcleritis and cotton-wool-like patches in the retina of another, and unilateral ocular muscle paresis and field defect in the third.

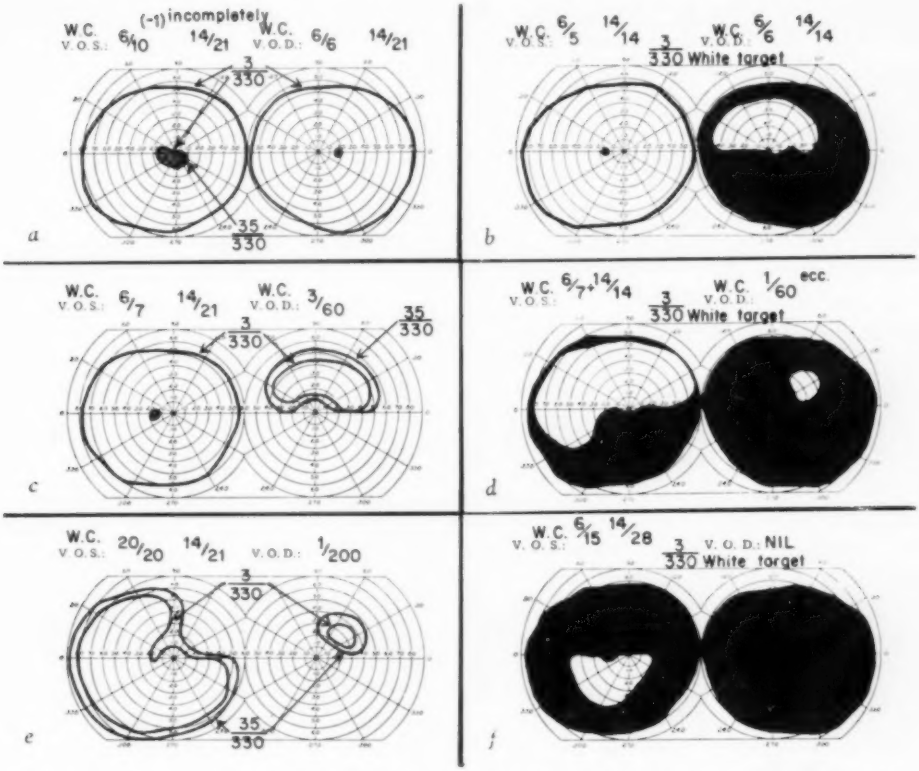
In the group of cases collected by Bruce, the women outnumbered the men three to one. This sex distribution was not present in our series of cases; there were 64 women and 58 men. Objective ocular lesions or visual symptoms definitely attributable to arteritis were noted in 37 (50 percent) of the 74 cases in which biopsy was positive and in 26 (54 percent) of the 48 cases in which the temporal arteries were not biopsied. Our youngest patient with ocular involvement was 60 years of age and the oldest 83 years of age.

At the time of dismissal from the clinic, six of the patients with positive biopsies were blind in both eyes, seven were blind in one eye and had partial loss of vision in the other, four had partial loss of vision in both eyes, three were blind in one eye but had normal vision in the other, and eight had partial loss of vision in one eye only. Nine of the patients in whom biopsy was not done were blind in both eyes, six were blind in one eye and had partial loss of vision in the other, seven had partial loss of vision in both eyes, two were blind in one eye but had normal vision in the other eye, and two had partial loss of vision in one eye only. Thus 15 (12 percent) of the entire group of 122 patients were blind in both eyes, and 39 (32 percent) had lesser degrees of visual loss, a total of 54 (44 percent) with impaired vision. Twelve of the patients in the biopsied group and eight in the nonbiopsied group had complained of episodes of transient loss of vision (amaurosis fugax) in one or both

TABLE 1

Subjective symptoms in 122 cases of temporal arteritis

	Positive Biopsy (74 cases)	No Biopsy (48 cases)	Total
Ocular involvement	41 (55%)	27 (56%)	68 (56%)
Loss of vision	28 (38%)	26 (54%)	54 (44%)
Bilateral blindness	6	9	15
Unilateral blindness with:			
Vision loss in other eye	7	6	13
Other eye normal	3	2	5
Incomplete loss of vision			
Bilateral	4	7	11
Unilateral	8	2	10
Amaurosis fugax			
Without permanent loss of vision	4	0	4
Preceding permanent loss of vision	8	8	16
Diplopia	11	1	12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3/330
35/330
e
W.C. V.O.S.: 6/15 14/28 3/330 V.O.D.: NIL White target
f

Fig. 1 (Wagener and Hollenhorst). Types of visual field defects in cases of temporal arteritis with ischemic optic neuritis. (a, b, c) Unilateral. (d, e, f) Bilateral.

eyes. Permanent loss of vision developed subsequently in eight of the 12 biopsied patients and in all eight of the nonbiopsied patients. Eleven of the patients in the positive biopsy group complained of diplopia, in a number of instances preceding loss of vision. The complaint of diplopia was recorded in only one of the nonbiopsied patients. These visual symptoms are given in Table 1. The visual field defects in the eyes with incomplete loss of vision vary considerably in type, but the majority have altitudinal characteristics (fig. 1).

Five of the 68 patients with ocular involvement had subjective symptoms only, and five had lesions which were thought not to be manifestations of the temporal arteritis syndrome (three occlusions of tributary veins, one retinopathy of hypertensive type, and one hemorrhage in the vitreous). So there were 58 patients who presented objective signs considered to be characteristic of temporal arteritis. The lesions observed in 100 eyes of these 58 patients are listed in Table 2. Ischemic optic neuritis was present in 64 eyes; in five of them it was of retrobulbar type, which we define as without visible edema of the disc. Occlusion of the central artery of the retina was found in two eyes, and occlusion of both the central artery and the central vein in one eye. Ischemic retinopathy without complete infarction of the retina was noted in four eyes, and residuals of previous acute optic nerve or ret-

TABLE 2

LESIONS IN 100 EYES OF 58 PATIENTS WITH TEMPORAL ARTERITIS WITH OCULAR INVOLVEMENT

	Positive Biopsy		No Biopsy		Total	
	Eyes	Patients	Eyes	Patients	Eyes	Percent
Ischemic optic neuritis	38*	23 (15 bilat.)	26†	16 (10 bilat.)	64	64
Ischemic retinopathy	3	2‡ (1 bilat.)	1	1	4	4
Occlusion of central artery	1	1	1	1§	2	2
Occlusion of central artery and central vein			1	1§	1	1
Residual optic nerve or retinal lesions	6	4 (2 bilat.)	18	9‖	24	24
Paresis of ocular muscles	5	3 (2 bilat.)			5	5
Total	53	32	47	26	100	100

* In four eyes neuritis was of retrobulbar type.
† In one eye the neuritis was of retrobulbar type.
‡ One patient had ischemic optic neuritis in other eye.
§ Ischemic optic neuritis in the other eye.
‖ In one case loss of vision may have been of cortical type.

inal lesions in 24 eyes. Rotations of five eyes were limited as the result of ocular muscle pareses.

FEATURES AND COURSE OF ISCHEMIC OPTIC NEURITIS

Either ischemia of the optic nerve or ischemic infarction of the optic nerve may be a more accurate designation of the type of involvement of the optic nerve than is ischemic optic neuritis, which is, however, the more generally accepted term. As previously noted, edema of the disc was visible ophthalmoscopically in 59 of the 64 affected eyes. The edema varied in degree from minimal, demonstrable only by indistinctness of the disc margins, to sufficient to elevate the disc two diopters. The elevation of one disc measured between two and three diopters in one case. Hemorrhagic areas, usually small, were associated with the edema of the disc in some instances and rather more frequently cotton-wool-like ischemic patches were present in the retina. Ischemic optic neuritis differs in its ophthalmoscopic appearance from the optic neuritis of multiple sclerosis, for instance, in several respects: the disc tends to be pallid rather than hyperemic; ischemic patches are likely to be present in the retina; in the early stages, fragmentation of the blood stream is seen not uncommonly in one or more retinal arteries or veins. Instead of the characteristic central scotoma of the more usual types of optic neuritis, the fields of vision in cases of ischemic optic neuritis tend to show altitudinal defects, as noted previously.

In the cases which we were able to observe from or near the onset, loss of vision seemed to precede the development of edema of the disc by 24 or 36 hours. The edema tended to increase during the next two or three days and began to recede during the sixth to the ninth day. Edema of the disc was visible usually for no more than seven to 10 days, but in one case, at least, it persisted for six weeks before clearing completely. The cotton-wool-like ischemic areas in the retina tended to persist for 10 to 15 days. Pallor of the disc usually became noticeable as the edema developed, an indication of its ischemic origin. In some cases the color of the disc tended to improve temporarily before the onset of residual, so-called atrophic, pallor. It would be of interest to know whether pallor of the discs develops

ultimately in all eyes which have lost vision in the course of temporal arteritis. The time necessary for the development of pallor depends probably both on the location of the arteritic lesion with reference to the disc and on the degree of occlusion of the arterial lumen. Nine of our patients with ischemic optic neuritis and positive biopsies were seen again three to 36 months after the first eye examination. Pallor of the discs, varying in grade from 1 to 3, was noted in seven. However, in one patient who had had originally ischemic optic neuritis with superior altitudinal anopsia, the discs were found to be of fairly good color 36 months later.

Ocular muscle involvement

Twelve of our patients complained of diplopia at some time in the course of their illness, but definite limitations of ocular rotations of paretic type could be demonstrated in only three at the time of our examination. Parsons-Smith[5] stated that "the various eye symptoms and signs in temporal arteritis are brought about by the disease process affecting the arterial supply of the optic and oculomotor nerves and the retina." Meadows[6] noted that transient diplopia or ocular palsy is an occasional feature, either alone or preceding the onset of blindness, due to a vascular lesion affecting the nerve or possibly the muscle itself. Considerable day-to-day variation in the muscles involved and in the degree of their involvement has been noted in the few cases we have been able to follow. It seems to us that the limitations of the ocular rotations must be caused by reduction of the blood supply to the muscles by arteritic lesions in the ophthalmic artery or in its branches to the muscles and that they can be compared to the so-called intermittent claudication of the jaw muscles which is of rather frequent occurrence in patients with temporal arteritis. Interestingly, there is a definite tendency to recovery of normal muscle function in these cases.

Time element in development of lesions of temporal arteritis

It should be borne in mind that inflammation or occlusion of the temporal arteries, although it is the outstanding clinical diagnostic sign of the disease, is not always an early manifestation, nor is it always noted by the affected person before coming to the physician. Of 66 patients with positive biopsies whose records were checked for information on these subjects, only 32 complained specifically of enlarged tender temporal vessels; 19 others mentioned tenderness of the scalp, face, or occipital area. Painful involvement of the temporal arteries was a primary symptom in a few cases, but it developed in most instances a week or more after the first symptoms of illness. One patient did not note inflammation of the temporal vessels until four months after and another until six months after the probable onset of the disease. Twenty-one of 26 patients with ocular involvement in the nonbiopsied group had noted inflamed temporal vessels or painful lumps in the temporal regions. In one of these cases, involvement of the temporal arteries had not been evident until eight months after the onset of symptoms of fibrositis. These symptoms had been controlled for four months under cortisone therapy but had recurred after the cortisone had been stopped one month before the temporal arteries became noticeably inflamed.

Loss of vision occurred at the same time in both eyes in only six of our cases. Usually there was an interval from one day to three weeks between the involvement of the first eye and that of the second eye in the cases in which there was loss of vision in both eyes. The longest interval in our group of cases was two months; so it would seem that the prognosis for retention of vision in the second eye should be good if that eye is not affected within two months after the first eye is involved.

The mode of onset is said by some patients to be gradual, and this may be true in a few

instances. In most cases, however, the loss of vision starts abruptly but it is likely not to be complete at first and it tends to progress in the next few days, in some cases to complete blindness. Loss of vision was said to be the primary symptom of temporal arteritis by two patients; they had not had headaches or tender temporal arteries and had not been ill. In the rest of the cases, the ocular involvement occurred at intervals varying from one week to 11 months after the first systemic symptoms of the disease, from less than one day to six months after the onset of headache or head pain, and from less than one day to four months after visible involvement of the temporal arteries. In one case inflamed temporal arteries had been observed 8.5 months before the loss of vision. This patient had been on steroid therapy but this had been discontinued for two weeks preceding the development of the defect in the visual field of the right eye.

Factors involved in diagnosis of temporal arteritis

Since ischemic optic neuritis is the ocular lesion encountered most frequently in proved cases of temporal arteritis, the occurrence of this ophthalmologic entity in persons over the age of 55 years should always suggest the possible presence of this systemic disease. The diagnosis of temporal arteritis should be considered also in cases of closure of the central artery of the retina, of suddenly developing altitudinal field defects, of "toxic" retinopathy, of retrobulbar neuritis, and of ocular muscle disturbances encountered in this age group. Suspicion that the ocular lesions are a part of the syndrome of temporal arteritis is heightened if the patient gives a history of general malaise, weakness, anorexia, and loss of weight. Twenty-seven of our 58 patients complained of these symptoms. Bruce[2] stated that the ophthalmologist should palpate the temporal arteries in all cases of occlusion of the retinal vessels or of acute retrobulbar neuritis. Cases of ischemic optic neuritis were included by him in this latter group. In his discussion of Bruce's paper, Anderson stated:

> I should like to add that the disease is readily recognized and in the typical case could only be overlooked by a mind conditioned to the consideration of such ophthalmologic problems as are bounded by the interpalpebral fissures and the optic foramen. There is perhaps no disease in ophthalmology in which the diagnosis may be more quickly and accurately ascertained by pausing for a few minutes to listen to the patient's story and to scan with a seeing eye the prominence and configuration of the temporal arteries.

These statements are undoubtedly true if the ocular involvement has occurred during the active stage of inflammation of the temporal arteries while they are still prominent, indurated, and tender, or if the patient has observed and gives an accurate history of previously enlarged and tender vessels in the temporal areas. But the patient has not always noted inflamed temporal vessels and, if the acuteness of the arteritis has subsided before the eyes are affected, it is not always easy to detect the presence of obliterated arterial branches even if the examiner has more experience in the palpation of peripheral arteries than the average ophthalmologist has. Gross arterial involvement was detected by consultants from the vascular section in only 85 percent of our cases with ocular lesions in which histologic examination of a segment of artery removed at biopsy revealed the presence of lesions diagnostic of temporal arteritis. It is wise for the ophthalmologist to have the erythrocyte sedimentation rate checked in all cases of ischemic optic neuritis and arterial occlusion, and probably also of recently developed ocular muscle disturbances observed in patients over the age of 55 years. The presence of an increase in the sedimentation rate in such cases is highly suggestive of temporal arteritis and warrants a tentative diagnosis of that disease. The erythrocyte sedimentation rate was found to be increased in 91 percent of our cases of temporal arteritis with eye involvement in which the rate was checked.

It was normal only in patients who had received cortisone or who had lost vision some months before coming to the clinic.

Importance of biopsies in suspected cases of temporal arteritis

Final proof of the diagnosis of temporal arteritis depends of course on the finding of characteristic histologic lesions in an involved artery. It is quite possible that not all patients over the age of 55 or 60 years who have ischemic optic neuritis or occlusion of the central retinal artery and an increased erythrocyte sedimentation rate have temporal arteritis. And it has not been proved that the sedimentation rate is necessarily increased at the time of onset of such ocular lesions in cases of temporal arteritis. Biopsy studies are essential for the correct differential diagnosis of these cases.

One of our patients, a man aged 78 years, at the time of his admission to the clinic had evidences of a previous occlusion of one central retinal artery and a sedimentation rate of 68 mm. in one hour (Westergren), but a specimen of the right occipital artery removed at biopsy proved to be essentially normal.

Meyerratken[7] reported two cases of bilateral blindness with the ophthalmoscopic picture of ischemic optic neuritis. The erythrocyte sedimentation rate was elevated in both cases. Histologic examination of segments of the temporal arteries removed at biopsy revealed the characteristic lesions of temporal arteritis in one case but only endarteritis obliterans in the other. Kreibig[8] obtained biopsies of the temporal arteries in eight cases of "opticomalacia" with ophthalmoscopic picture of ischemic optic neuritis. Characteristic lesions of temporal arteritis were found in six cases; the sedimentation rate was high in the five cases in which it was checked. The specimen removed at biopsy in one of the cases proved to be normal artery and in the other showed the changes of endarteritis obliterans; the sedimentation rate was normal in both of these cases. François, Verriest, and Baron[4] described under the title of "vascular pseudopapillitis" six cases of ischemic optic neuritis which they thought were of arteriosclerotic origin. The erythrocyte sedimentation rate was high in three of them, patients aged 75, 77, and 72 years. A temporal artery was biopsied in two of these cases; no arteritic lesions were found histologically.

It is always satisfying and often important to the examiner to have his clinical diagnosis of temporal arteritis confirmed by biopsy. However, negative biopsy findings may be of equal or even greater importance, especially in cases in which either the ocular or the systemic manifestations are somewhat atypical.

Case 1

A man, aged 70 years, entered the hospital with a five-month history of fatigue, anorexia, and loss of weight of 15 to 16 pounds. Pain in the right temporal area had been present for five or six weeks. Recently, the pain had become sharp and shooting in type, extended to the ear and upper jaw, and was associated with tenderness of the overlying skin. The blood pressure was 160 mm. Hg systolic and 84 diastolic, the concentration of hemoglobin was 9.2 gm. per 100 cc. of blood, and the erythrocytes numbered 2,820,000 and the leukocytes 8,000 per cu. mm. of blood. The erythrocyte sedimentation rate was 135 mm. in one hour (Westergren). Temporal arteritis was suspected. However, the lesions found on examination of the eyes were not typical of that disease.

The vision, visual fields, and ocular rotations were normal. Mild hypertensive changes were visible in the retinal arterioles. In the left retina, just below the optic disc, there was a large superficial soft exudate with a small hemorrhage at its margin. Large nodules of episcleritis were present temporal to each cornea, a smaller one nasal to the right cornea, and a faint one nasal to the left cornea. The pathologist did not find any evidence of arteritis in the tissue removed at biopsy from the right postauricular area.

Though the failure to find evidence of arteritis in a single biopsy specimen does not necessarily rule out the diagnosis of temporal arteritis, the ocular and other clinical findings in this case were not sufficiently typical to permit a definite diagnosis of this disease. It seemed more probable that this

man had a diffuse collagen disease, since episcleritis and so-called toxic retinopathy are seen so frequently in this type of disease process. It may be of interest to note that the nodules of episcleritis disappeared rapidly under cortisone therapy.

In his article on "Intracranial aneurysms," published in 1931, Schmidt[8] reported a case which would be diagnosed now as "temporal arteritis." A man, aged 69 years, a few weeks after a mild attack of "influenza," suffered from violent pains extending from the ear up into the scalp, first on the right and later on the left side also. The scalp was tender. Low-grade fever, anemia, and weakness were prominent symptoms. "Both temporal arteries were firm and thickened; later during the disease first the left temporal artery and then the right thrombosed, and became pulseless; now nine months after the onset of the disease, the pulse is still absent from the right one and only doubtful in the left." About eight months after the onset of the illness, a noise in the head and a superior altitudinal paracentral scotoma in the right eye suddenly developed. On direct auscultation, "a soft noise, synchronous with the pulse" could be heard. The diagnosis of aneurysm of the right internal carotid artery was made clinically. It was assumed that the aneurysm had developed as a result of local weakening of the vessel wall subsequent to the resorption of a postinflammatory thrombus. In the light of recent histopathologic studies, this would seem to be a rare occurrence in arteries in which the inflammatory or degenerative lesions are of the type seen in temporal arteritis.

In view of the frequent development of altitudinal defects in the visual fields of patients with temporal arteritis, there would be perhaps a tendency nowadays to ascribe the scotoma in this case to arteritic involvement of the ophthalmic or central retinal artery. Histologic examination of a segment of the apparently involved temporal artery was of considerable importance in the diagnostic study of one of our cases which was similar in some respects to the one described by Schmidt.

CASE 2

A 72-year-old man was admitted to the clinic complaining of headaches, anorexia, and loss of weight of more than 20 pounds. The headaches were left frontal in location and the pain extended into the left face, neck, and shoulder. The headaches, which had gradually increased in severity and frequency during the past one and one-half years, were constant at the time of admission, and there was associated tenderness in the area of the pain. The patient complained also of episodes of transient diplopia and of blurring of vision which seemed to precede exacerbations of the facial pain.

Examination of the eyes revealed slight limitation of rotations of the left eye except in the field of the lateral rectus muscle. The limitation seemed to vary in degree at different examinations but was associated with slight ptosis. The left pupil was slightly larger than the right and reacted less promptly. Central vision of each eye was normal but perimetric and tangent-screen studies revealed mild contraction of the lower temporal field of the left eye. The ocular fundi were normal except for the presence of mild hypertensive changes in the retinal arterioles.

Because both temporal arteries were tortuous and thickened though not occluded and because there was tenderness to palpation over the left temporal artery, the diagnosis of temporal arteritis was suggested. However, a segment of the tender left temporal artery was reported by the pathologist to show only "moderate intimal fibrous thickening. No evidence of temporal arteritis."

Because of the evidence of involvement of the left third nerve and of the suggestion of a prechiasmal lesion of the left optic nerve, a left carotid angiogram was made and revealed the presence of a small berry aneurysm arising from the internal carotid artery before its bifurcation into the middle and anterior cerebral arteries. If the temporal artery had not been biopsied in this case, the diagnosis of temporal arteritis might have been accepted, since the erythrocyte sedimentation rate was 45 mm. in one hour (Westergren), there was mild anemia, and a previous ventriculogram had suggested only the presence of degenerative changes in the brain.

LOCATION OF ARTERIAL LESIONS FOUND AT NECROPSY IN CASES OF TEMPORAL ARTERITIS WITH OCULAR INVOLVEMENT

The presence of constitutional symptoms such as low-grade fever, weakness, anorexia, and loss of weight in many of the individuals who have the typical ocular lesions of temporal arteritis always has suggested that the

arteritic lesions are not limited to the superficial temporal and facial arteries and to the arteries supplying the retina and optic nerve. And it is known now, from the study of material obtained at necropsy, that the arteritis is more widespread than had been supposed originally. Of particular interest to ophthalmologists are the studies of Cooke and his co-workers,[10] of Cardell and Hanley,[11] and of Heptinstall, Porter, and Barkley.[12] They were able to demonstrate characteristic histologic lesions not only in such large arteries as the aorta, the carotids, the radials, the femorals, and others but also in the ophthalmic and central retinal arteries, in which previously they had been only postulated from the clinical findings. Unfortunately, however, these histopathologic necropsy studies have raised some questions which have not been satisfactorily answered as yet. This is particularly true with regard to the criteria which should be accepted as diagnostic of "temporal arteritis" and to the factors involved in the production of the loss of vision and of the ophthalmoscopically visible changes in the optic disc and retina.

Meneely and Bigelow[13] expressed doubt that all types of inflammatory lesions of the temporal artery should be interpreted as "temporal arteritis." Believing that pathology rather than regional distribution should be emphasized, they stated: "It seems valid to assume that granulomatous arteritis of arteries other than the temporal, when the lesions exhibit the same type of pathologic change as that seen in temporal arteritis, represents a manifestation of the same fundamental disorder." However, it seems obvious that, from the clinical ophthalmologic standpoint, the cases of "giant-cell chronic arteritis" reported by Gilmour[14] do not fit into the present-day concept of "temporal arteritis."

The fact that thrombosis is not a constant characteristic feature of giant-cell arteritis is probably of considerable importance in determining the nature of the ocular lesions which are most typical of temporal arteritis. Heptinstall, Porter, and Barkley[12] stated: "In this series intimal proliferation was the main cause of a reduction in size of the arterial lumen and actual thrombosis was infrequent." And Meadows[6] commented: "It may be that the general reduction in the lumen of the artery is a more potent cause of ischemic damage than is actual thrombosis." The presence of a thrombus in the lumen of the biopsied temporal vessels was specifically noted by the surgeon or the pathologist in one third of our cases.

The ophthalmic and central retinal arteries were not available for study in any of our cases, and only a few reports of the histopathologic studies of these vessels have appeared in the literature. In most instances it is difficult to correlate the arterial lesions found at necropsy with the changes observed ophthalmoscopically in the ocular fundi during life. In one of the cases studied by Cooke and his co-workers:[10]

> Both retinal arteries were equally affected. The lumen was obliterated by cellular fibrous tissue obviously formed during the organization of a thrombus. The adventitia and media were infiltrated by lymphocytes and plasma cells, and the internal elastic lamina was fragmented and calcified. A few giant cells were engaged in phagocytosis of these calcified fragments. These changes could be traced forward into the branches of each artery.

Ophthalmoscopically, this patient had shown only edema of the discs with subsequent optic atrophy. However, since blindness had been present for four months before death, it is possible that the central retinal arteries became thrombosed only after the development of secondary optic atrophy. Both optic nerves were markedly softened.

In the case reported by Cardell and Hanley[11] there was, at the time of the first examination, a severe spasm of the right inferior temporal arteriole and complete occlusion of the left central retinal artery. Occlusion of the right central retinal artery also developed later. Histologically:

> In the right ophthalmic artery the lumen was much reduced in size by intimal thickening and an organizing thrombus was present in the lumen. There were no changes in the wall of the right

retinal artery but an organizing thrombus was present in the lumen. . . . In the left ophthalmic artery, the cellular infiltration including multinucleated giant cells, extended out into the periadventitial tissue. . . . The proximal portion of the left retinal artery showed typical changes of giant-cell arteritis. The lumen was reduced to a slit, but no thrombus was present.

The optic nerves were found to be grossly degenerated.

One of the patients reported by Kreibig[8] had lost the vision of the right eye 10 days before death. Ophthalmoscopically, there had been definite edema of the disc with small hemorrhages on its surface. It was found at necropsy that there was an ischemic infarct in the right optic nerve just posterior to the lamina cribrosa. The lumen of the segment of the ophthalmic artery lying outside the optic nerve was found to be completely closed by the changes of giant-cell arteritis. The lumina of the central retinal artery and vein in the optic nerve were open. Meadows[6] stated that the usual findings in the early stages of visual involvement were slight or moderate papilledema with a few hemorrhages around the disc. He said:

Evidence of arteritis and occlusion of the central retinal artery early in its course, before it enters the optic nerve, was found on postmortem examination in one patient in the present series, and it may be that arterial blockage at this site is related to the absence of the classical ophthalmoscopic features of arterial occlusion.

Meadows suggested also that "involvement of the short ciliary arteries as they take part in the formation of the arterial circle of Zinn surrounding the nerve head may be the cause of the visual loss which is accompanied by little change in the fundus oculi apart from blurring of the optic discs." Lending some support to this contention is the fact that Cardell and Hanley[11] and Kreibig[8] did find histologic changes in some of these vessels in their cases.

It is particularly difficult to explain the ophthalmoscopic picture on the basis of the findings at necropsy in two of the cases reported by Heptinstall, Porter, and Barkley.[12] In one of the cases, the right eye was blind and the vision of the left eye was limited to the ability to see moving objects. Papilledema with hemorrhages and exudates was seen in each eye ophthalmoscopically. However, at necropsy 14 months later, lesions were found in both common carotid arteries but "no histologic evidence of arteritis was present in the ophthalmic or retinal arteries, nor in fact did the optic nerve itself show any gross degeneration." In another case, both eyes had been blind at one time, but there had been some improvement of vision under cortisone and corticotropin therapy. Presumably the fundi were negative; it was stated that there was no evidence of optic atrophy. At necropsy, both vertebral and both posterior cerebral arteries were found to be thrombosed and there was extensive softening of both occipital lobes. The authors stated: "Loss of vision appears to have been due to the infarction of the occipital cortex of both sides. Changes of giant-cell arteritis were present in both ophthalmic arteries but complete occlusion of the vessels was not found."

In discussing Bruce's paper, MacLean brought out the fact that, in the opinion of some pathologists, temporal arteritis and periarteritis nodosa are one and the same condition from the standpoint of pathologic changes. The question of the possible relationship between temporal arteritis and periarteritis nodosa has continued to be of considerable interest. Meneely and Bigelow[13] stated: "Soon after temporal arteritis was reported as a new and unusual clinical entity, the suggestion was made that it might represent merely a variant of periarteritis nodosa." But they stated further that, actually, temporal arteritis "appears to represent a distinct clinicopathologic entity."

Previously, Chasnoff and Vorzimer[15] had stated: "The histologic changes found in thromboangiitis obliterans, periarteritis nodosa, and rheumatic arteritis are sufficiently different from those seen in temporal arteritis to warrant regarding the latter as a distinct pathologic entity. However, the changes noted in the vessels are not limited to the

temporal arteries." And Cooke and his coworkers[10] had pointed out differences between the histopathologic lesions in temporal arteritis and those in periarteritis nodosa.

More recently, in discussing the relationship between temporal arteritis and periarteritis nodosa, Heptinstall, Porter, and Barkley[12] stated: "Thus, although in many respects giant-cell arteritis and polyarteritis nodosa are similar, there are sufficient points of difference to warrant keeping them apart in our present state of knowledge." One of the patients in our series presented an interesting diagnostic problem.

CASE 3

A woman, aged 71 years, was admitted to the hospital with a five-month history of anorexia, loss of weight, and weakness. There had been two episodes of pleurisy and pneumonia during this period. Fever, chills, and sweating had been noted during the past three weeks. There had been no complaint of headaches, but there had been tenderness in the temporal regions, especially on the right, and there had been some soreness in the muscles of the jaws.

In the hospital, the patient's temperature ranged between 99° and 102°F., the concentration of hemoglobin measured 10.6 gm. per 100 cc. of blood, and the erythrocytes numbered 3,540,000 and the leukocytes 9,000 per cu. mm. of blood. The erythrocyte sedimentation rate was 124 mm. in one hour (Westergren). The systolic blood pressure varied between 120 and 180 mm. Hg, and the diastolic between 72 and 120 mm. Hg. Both temporal arteries were firm and tortuous, and tenderness and localized increased induration were noted in an anterior branch of each main artery; pulsation was still present in the main arteries. Examination of a segment of the right temporal artery removed at biopsy revealed changes consistent with the diagnosis of "temporal arteritis," though the completely typical giant-cell granulomatous reaction was not present (fig. 2-a).

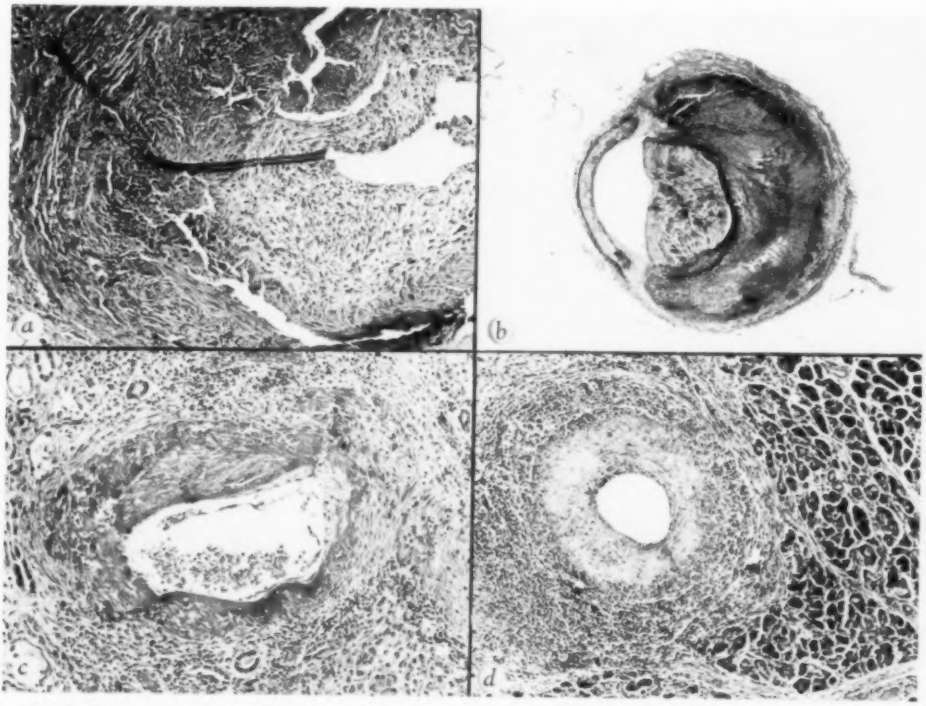

Fig. 2 (Wagener and Hollenhorst). *Case 3.* (a) Section of right temporal artery; granulomatous inflammation of media and edematous thickening of intimal layer, lumen reduced in caliber but still open. (b) Section of gastric artery; necrosis of two thirds of wall. (c) Section of right kidney; acute necrotizing arteritis. (d) Section from head of pancreas; note completely necrotic artery, a recent acute process.

Cortisone therapy was started and was continued in the hospital for 16 days, during which time the patient received 3,000 mg. The patient left the hospital considerably improved but returned six days later with the complaint of numbness of the feet and ankles and of the right hand. A neurologic consultant made the diagnosis of peripheral neuritis, and periarteritis nodosa was suspected as the underlying cause. Cortisone therapy was continued.

Approximately five weeks after the original admission right hemiplegia developed, and three weeks later the patient died. Necropsy revealed generalized periarteritis nodosa and acute focal and diffuse glomerulonephritis with uremia. The pathologist stated that typical lesions of periarteritis nodosa in various stages of evolution and repair were present in the peripheral nerves and in practically every organ except the brain and the thyroid (fig. 2-b, c, and d). The heart was hypertrophied and moderate arteriosclerosis was present in the aorta and in the cerebral arteries.

Examination of the eyes six days after the first admission had revealed that the vision and visual fields were normal and that the fundi were normal except for mild evidences of chronic hypertensive disease. However, one month later, during her second stay in the hospital and four days before the right hemiplegia developed, the patient had noted blurring of the vision of the right eye after awakening in the morning. Examination of the eyes at intervals during the day showed varying degrees of stasis of the circulation in the right retina. Signs of complete occlusion of the retinal arteries did not develop, however. Examination of the visual fields revealed an incomplete right homonymous hemianopsia. Clinically, the changes seen in the right retina were considered to be more characteristic of temporal arteritis than of periarteritis nodosa. The exact nature of the lesions in the right ophthalmic and central retinal arteries was not determined, since these vessels were not examined at necropsy.

Treatment

An entirely satisfactory method for the prevention or control of the ocular manifestations of temporal arteritis has not been found as yet. The onset of the loss of vision is so sudden and its progress is so rapid in most cases that little time is given for the institution of therapeutic measures. Opinions differ as to the value of vasodilator drugs, stellate ganglion block, and anticoagulants.

In discussing Bruce's paper at the 1949 meeting of the American Ophthalmological Society, MacLean made a statement which is of interest in the light of subsequent developments. He said: "I was informed by one of my medical confreres recently that compound E, not vitamin E, may eventually be found to prove beneficial in this condition."

Since October, 1949, most of the patients who had temporal arteritis with or without ocular involvement seen at the Mayo Clinic have been treated with cortisone or related adrenal corticosteroids. There appears to be little difference in the rate of objective healing of an ischemic optic neuritis with or without steroid therapy. However, steroid therapy did seem to improve the visual end results in cases in which there was only partial loss of vision at the time treatment was started. Vision has not returned in any eyes which were blind at the time of the first examination.

The following brief case reports can be cited as illustrative of the better results obtained by the use of cortisone as compared to other types of therapy. But it must be remembered that these are selected cases and that the course of the visual loss in cases of untreated ischemic optic neuritis varies sufficiently to make it difficult to evaluate the effect of treatment in any particular case.

Case 4

A woman, aged 68 years, had normal vision when admitted to the hospital, but cotton-wool-like ischemic patches were present in each retina; the optic discs were normal. Eleven days after admission, she experienced sudden loss of vision of the left eye and the left optic disc was found to be edematous. Dicumarol therapy was started, but three days later the left eye was totally blind and there was a nasal defect in the visual field of the right eye (fig. 3). Intravenous histamine therapy was started, but the vision of the right eye continued to fail and evidence of occlusion of the central retinal artery was visible in the right fundus. Twenty-two days after admission, both eyes were blind.

Case 5

A woman, aged 71 years, had on admission some reduction of central vision, especially of the left eye, due apparently to senile nuclear lens opacities. However, examination of the visual fields, made because of the complaint of episodes of brief, transient loss of vision, revealed the presence of a relative superior arcuate scotoma in the field of the right eye. Ophthalmoscopically, there was a suggestion of ischemic edema of the right optic disc and there were three cotton-wool-like ischemic patches

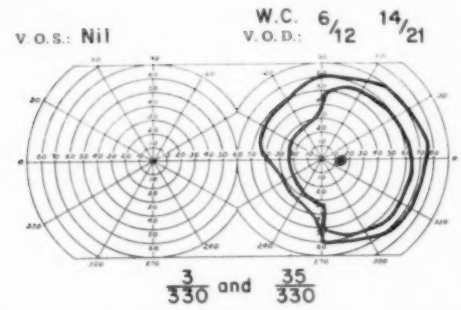

Fig. 3 (Wagener and Hollenhorst). *Case 4.* Perimetric fields two weeks after admission showing contraction of nasal field of right eye and complete blindness of left eye.

in the left retina. Cortisone therapy was started and was continued for 14 months. There was mild increase in the edema of the right optic disc during the first few days of treatment, and there was some increase in the defect in the visual field of the right eye (fig. 4). But there was no further loss of vision after the sixth day of treatment, the episodes of amaurosis fugax ceased to occur, and the edema of the right disc and the cotton-wool-like patches in the left retina gradually resolved. The visual fields were found to be unchanged at a follow-up examination about three years later.

Birkhead, Wagener, and Shick[16] recently reviewed the results obtained by adrenal corticosteroid treatment in 55 cases of temporal arteritis in which the lesion was proved at biopsy. It was found that, at the time of dismissal from the clinic, 38 percent of the 55 cortisone-treated patients had some loss of vision and nine percent were blind in both eyes; 16 percent of the 110 eyes of the patients in this group were blind. By comparison, 43 percent of 53 patients who did not receive cortisone had some loss of vision at the time of dismissal and 17 percent were blind in both eyes; 23 percent of the 106 eyes of the patients in this group were blind. It would seem that the lowered incidence of bilateral total blindness in the cortisone-treated group is encouraging. And it might be hoped that, with earlier diagnosis of cases of temporal arteritis and the institution of adequate adrenal corticosteroid therapy before the onset of loss of vision and its continuance until the disease has reached the quiescent stage, the incidence of bilateral blindness might be still further reduced.

With reference to the treatment of patients with temporal arteritis and loss of vision, Birkhead, Wagener, and Shick[16] stated:

> In the past, we have not routinely administered anticoagulant agents to patients with temporal arteritis. We feel, however, that the combined use of anticoagulants and adrenal corticosteroids might be indicated and might be of value in certain instances, notably for patients who have sustained recent impairment or loss of vision in one eye. It is conceivable that in such cases inflammatory changes already may have developed in the ophthalmic artery of the presumably uninvolved eye and that subsequent thrombosis with loss of vision might supervene, with or without steroid therapy. The intermittent inhalation of 100 percent oxygen has seemed to be of some benefit in patients with acute or recent visual impairment, but we have not been

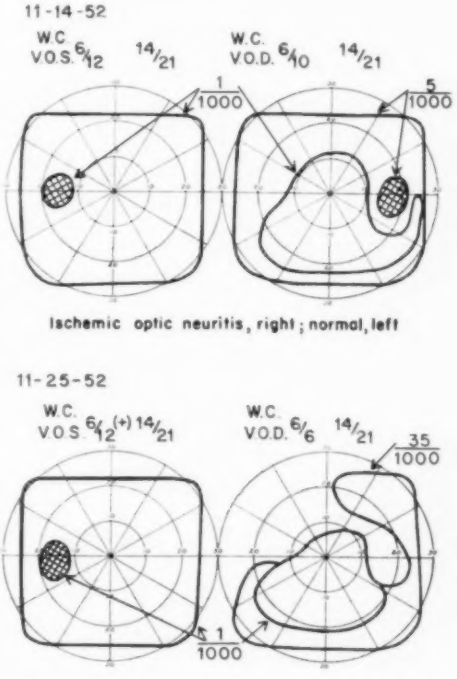

Fig. 4 (Wagener and Hollenhorst). *Case 5.* Tangent screen fields one day after admission and 11 days later showing increase in density of superior arcuate scotoma and superior nasal defect.

impressed with the value of vasodilating drugs or stellate-ganglion blocks in such cases.

Summary

Fifty-four of 122 patients with temporal arteritis observed at the Mayo Clinic had some degree of impairment of vision due to that disease. Fifteen were blind in both eyes; 18 were blind in one eye. The most common local cause of the loss of vision was acute ischemia of the optic nerve (ischemic optic neuritis).

Permanent loss of vision is preceded at times by episodes of brief, transient loss. Other ocular manifestations of the temporal arteritis syndrome are ischemic retinopathy, ischemic infarction of the retina, and ischemia of the extraocular muscles. The anatomic basis of the lesions of the optic nerve, the retina, and the ocular muscles is giant-cell arteritis involving the ophthalmic artery or its branches. The histologic lesions of temporal arteritis are distinct from those of periarteritis nodosa, but there may be some, as yet undetermined, relation between these two entities.

The history given by the patient and the evidence obtained by palpation of the temporal and occipital arteries and by determination of the erythrocyte sedimentation rate are adequate to establish the diagnosis with a sufficient degree of accuracy in most of the cases coming to the ophthalmologist with eye lesions suggestive of this disease. However, to avoid errors in diagnosis, histologic studies of segments of the apparently involved arteries removed at biopsy should be obtained whenever possible, particularly in cases which are atypical in any respect. It is possible that early diagnosis of cases of temporal arteritis and prompt and adequate treatment with adrenal corticosteroids will reduce the incidence of blindness which is the most distressing sequel of this disease.

The Mayo Clinic.

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MALIGNANT SYNOVIOMA OF THE SUPERIOR OBLIQUE

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The term "synovioma" was introduced by Smith (1927) to cover a group of malignant tumors which originate in synovial membranes of joints, bursae, and tendon sheaths, and in fascial aponeuroses. The tumors, now grouped under the heading "synovioma," include both benign and malignant types and numerous reports of their occurrence and reviews of the present state of our knowledge have appeared in pathologic and surgical literature in recent years.

Malignant synovioma presents commonly in such sites as the knee—often in the popliteal space, ankle, metatarsal joints, elbow, thigh, arm, and hand. It infrequently involves the joint-cavity of the joint near which it grows but more often arises from the capsule of the joint or the sheath of tendon, to which it may be attached firmly or only focally, while growing from thence outward into the surrounding tissues. It may occur at any age, although it is more common in those patients under the age of 30 years.

As seen macroscopically, the tumor gives a false appearance of encapsulation or partial encapsulation which is attributable to compression of the surrounding tissues. In fact, the tumor infiltrates the tissues and it has been noticed that it has a special tendency to surround blood vessels and infiltrate along their course. It also has a tendency to invade bone.

Microscopic examination reveals this and also shows that the tumor differentiates in two directions: one toward the formation of clefts or spaces, which in a well-differentiated tumor assume a lining of mesothelial cells; and in the other direction toward the formation of connective tissue of fibrous or fibrosarcomatous type. All degrees of differentiation in one or other, or both, of these directions may be encountered, so that a well-differentiated tumor in this group may be very easy to recognize; while an undifferentiated tumor may easily be labelled sarcoma and its true nature remain unsuspected. To summarize the criteria for the recognition of these tumors we may accept the following characteristics:

1. Pseudoencapsulation.
2. Attachment to joint capsule, tendon sheath, bursa, or aponeurosis.
3. Synovial differentiation with the formation of clefts or spaces, sometimes cyst-like, lined by mesothelial cells.
4. The formation of papillary processes projecting into these spaces.
5. The occurrence, but seldom, of mucin in the spaces.
6. Differentiation into fibrous or fibrosarcomatous tissue, laying down collagen.
7. A tendency to infiltrate around blood vessels.
8. The formation of multinucleated giant cells of osteoclast or foreign-body type, especially in association with the tumors which arise from the tendon sheaths.

Not all these criteria are fulfilled by all synoviomas, nor even by different parts of an individual synovioma. In some there is so little differentiation that the formation of mesothelial-lined clefts is rudimentary or absent. There may be no mucin in the tumors; giant cells may be absent and the supporting stroma may be mainly collagenous. To some extent these differences may be attributable to the site at which the tumor arises and the stage of growth which it has reached. Some of these tumors take as long as 15 years to become clinical problems, while others compel attention in a month. An orbital synovioma is sufficiently rare to merit report and we have not found in the literature a case similar to that which we now describe.

Case report

History and examination

The patient, a healthy, active boy (H. S.), aged three and one-half years, was seen by one of us (L. B. S.-L.) in July, 1952. Previous history was irrelevant and his presenting complaint was gradually increasing ptosis of three weeks' duration, affecting the left eye.

Examination showed ptosis of the left lid extending to the upper border of the pupil, with elevation limited to this. No loss of ocular movements and no inflammation were apparent, the eye and adnexa being otherwise normal. On palpation a hard, smooth, immobile mass about the size of a pea could be felt in the upper inner angle of the orbit. The right eye was normal and other examinations were negative.

Treatment

An exploratory incision was made over the mass (July, 1952) which was easily freed and went back before the exploring tip of the finger, to disappear apparently under the roof of the orbit. Nothing further was done at this stage. There followed a rapid growth of the mass, so that in 10 days it had become about the size of a walnut. It was firm in character and could be pushed back into the orbit. Complete ptosis was now present, with almost total paralysis of elevation. There was limitation of the upward movement of the globe. Other movements were normal and there was no proptosis.

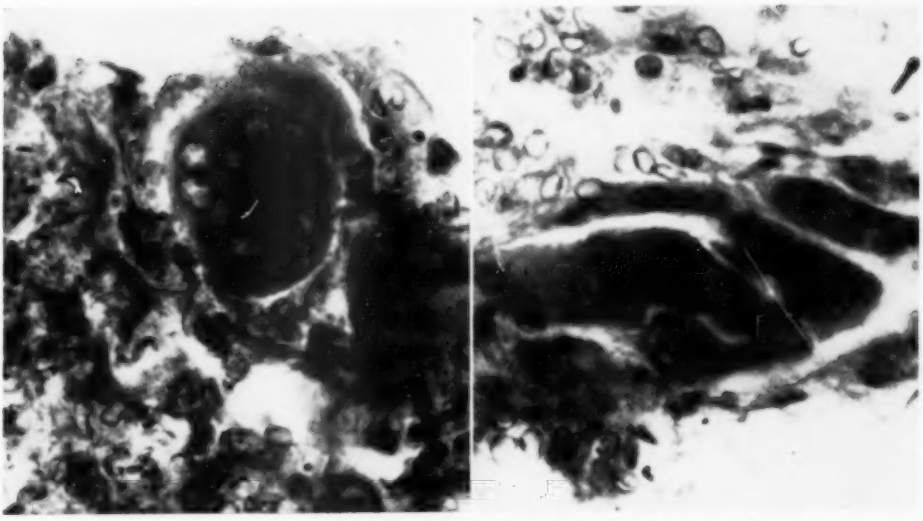
A second operation was performed 11 days after the first. The mass was readily shelled out of the lid, but it appeared to have a long tail extending into the orbit. Pathologic examination (R. A. Q. O'M.) showed an actively growing sarcomatous type of tumor with many mitotic figures. The tumor was very cellular, its component cells being large, polyhedral, round or elongated, and in places ran in parallel lines or seemed to form imperfect spaces. In some parts the cells appeared to form rudimentary tufts. The appearance was that of an undifferentiated mesenchymal tumor, but it had a certain resemblance both in cell character and arrangement to what may be seen in undifferentiated malignant synovioma.

A third operation involving complete subperiosteal exenteration of the orbit was, therefore, performed. There were no adhesions. Both lids were entirely removed; no grafting was attempted. Deep X-ray therapy was commenced on the fifth day after operation. A daily dosage of 1,000 r at 200 kv. was given to the socket for five days. The orbit healed rapidly and became completely lined with good healthy skin in less than two months.

Pathologic findings

Following removal of the eye and its adnexa, it was seen that the apparent encapsulation of the tumor was false, since infiltration of the tissues of the upper part of the orbit, including the upper lid, was present. Examined macroscopically, the

Fig. 1 (Somerville-Large and O'Meara). Section through trochlea and tendon of the superior oblique. The tendon is seen to be involved as it emerges from the trochlea. (Hematoxylin-eosin, ×45.)



Figs. 2 and 3 (Somerville-Large and O'Meara). Typical osteoclastlike giant cells found in the tumor near the trochlea. (Hematoxylin-eosin, ×800.)

specimen showed attachment of the tumor to the sheath of the superior oblique at the trochlea and irregular infiltration forward and laterally so as to invade the superior rectus and the levator palpebrae superioris.

Microscopic examination showed involvement of the sheath of the tendon of the superior oblique and invasion of the tendon just anterior to the cartilagenous loop of the trochlea (fig. 1). There was evidence of invasion of the perichondrium of the loop as well. Although the tendon and its sheath showed the presence of the tumor, there was virtually no infiltration of the belly of the muscle itself and this in spite of the fact that the superior rectus, the levator palpebrae superioris, and the tissues of the upper lid, including even the conjunctiva at some points, all showed invasion. Infiltration forward from the point of origin of the tumor was, thus, a striking feature, agreeing with the clinical finding of ptosis without proptosis.

Histologically, the tumor is poorly differentiated and correspondingly difficult to recognize. It shows two distinct types of growth, one of which is composed of the polyhedral, round or elongated cells previously described, with the formation of imperfect clefts and spaces lined by these cells. Stains for mucin were negative or doubtful. The rest of the tumor is fibroblastic in character, varying between fibrosarcoma with many miotic figures at some points and mature collagenous fibrous tissue at others.

In arriving at a conclusion that the tumor is a synovioma, the following characteristics of synovioma have been established:

1. Pseudoencapsulation.
2. Attachment to tendon sheath (fig. 1).
3. The presence of characteristic multinucleated giant cells near the site of origin of the tumor at the trochlea (figs. 2 and 3).
4. Infiltration around blood vessels, which is very striking (fig. 10).
5. Marked differences in the character of the cellular components as between those resembling mesothelial cells and those differentiating into fibrous tissue cells (figs. 5 to 9).
6. Although synovial differentiation is poor, there is a tendency for the tumor cells to form clefts in some places (figs. 4 and 6).

The tumor was too undifferentiated to form papillary processes projecting into the spaces and, with this exception, the criteria for the identification of synovioma have been fulfilled.

Discussion and Summary

The case presents features of clinical and pathologic interest. Clinically, the only symptom was ptosis which is explained by the pathologic finding of infiltration of the levator palpebrae muscle by the tumor. The marked rapidity of growth once the tumor was freed from its attachments is another striking point, as is also the complete and rapid lining of the orbit with skin in the absence of grafting.

The patient has now remained completely

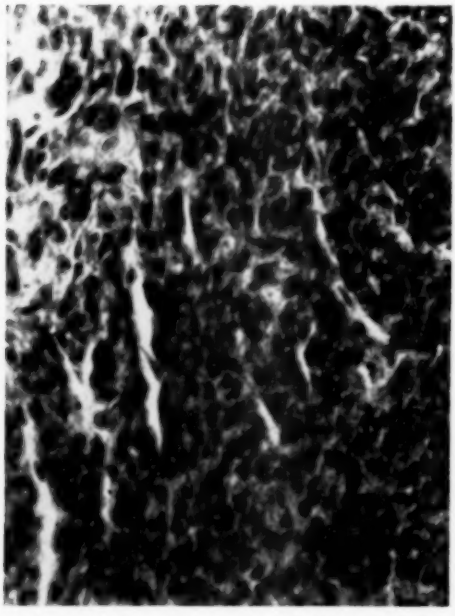


Fig. 4 (Somerville-Large and O'Meara). The tumor is undifferentiated with a diffuse cellular structure but shows some tendency to form small spaces. (Hematoxylin-eosin, ×380.)

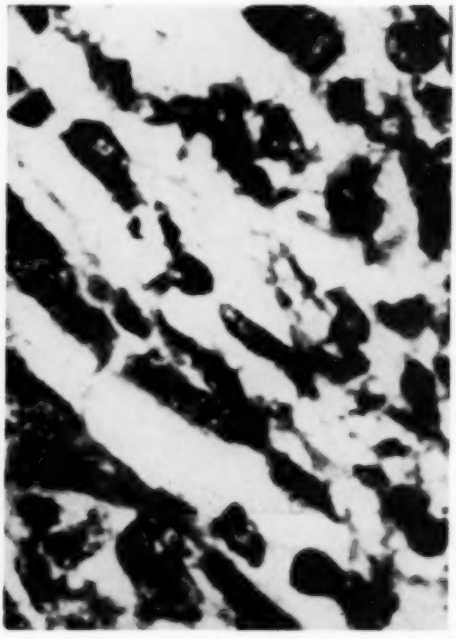
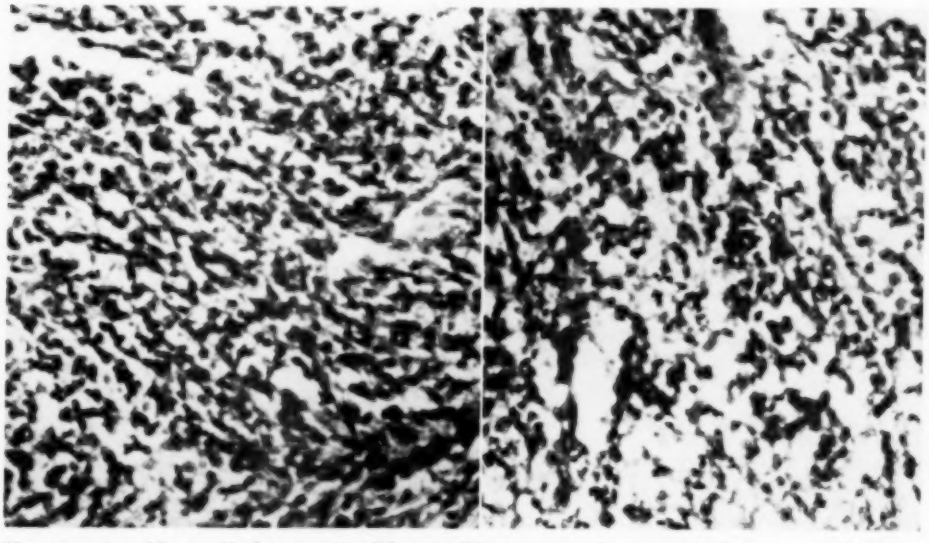


Fig. 7 (Somerville-Large and O'Meara). Detail of Figure 6 to show cell character and small cleft. (Hematoxylin-eosin, ×800.)



Figs. 5 and 6 (Somerville-Large and O'Meara). Edematous mucinous tumor tissue composed mainly of spindle cells with fine processes. Space formation is apparent in Figure 6. (Hematoxylin-eosin, ×200.)

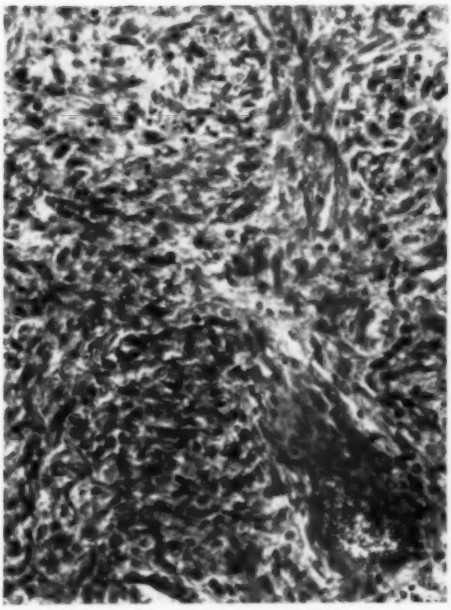


Fig. 8 (Somerville-Large and O'Meara). A fibrous part of the tumor. (Hematoxylin-eosin, ×200.)

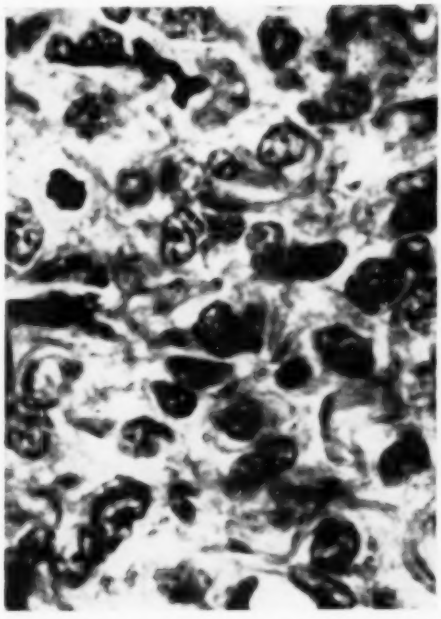


Fig. 9 (Somerville-Large and O'Meara). Detail of Figure 8 to show round and spindle cells and numerous mitoses. Collagen formation by some of the cells is apparent. (Hematoxylin-eosin, ×800.)

Fig. 10 (Somerville-Large and O'Meara). Infiltration of palpebral muscles by tumor. Near the center, infiltration around a blood vessel is well shown. There is also some inflammatory cellular infiltration in this tissue. (Hematoxylin-eosin, ×140.)

well for five years following the operation, with no sign of recurrence. The tendency revealed by parts of the synovioma in this case to differentiate in the direction of fibrosarcoma with the formation of collagen may have had a favorable influence on this outcome, since wholly undifferentiated malignant synovioma as a rule tends to recur rapidly. The removal of the periosteum of the orbit at the time of operation may, also, have had a favorable influence, since in this way total removal of the tumor cells was more likely to have been achieved and the danger of invasion of the bone of the orbit by the synovioma was reduced.

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We are indebted to Mr. F. A. Murray for the photographs.

REFERENCE

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HEREDITARY DEEP DYSTROPHY OF THE CORNEA*

ALBERT C. SNELL, JR., M.D., AND EDWARD S. IRWIN, M.D.
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This report is based on the examination of a kindred, seven of whose members exhibit hereditary deep dystrophy of the cornea, an unusually large number for this rare disorder.

The differential diagnosis of the disorder and especially its relationship to Fuchs' endothelial dystrophy has been clarified by the classification of Franceschetti, Klein, Forni, and Babel,[1] and by a report by McGee and Falls,[2] whose review of the scanty number of publications on this topic still appears to be complete. No studies of the pathology of the disease have been reported.

Almost every author has a different name for this disease, and the present authors are no exception. In support of the above title, there is no doubt that the hereditary or familial nature of the disease should be reflected in its nomenclature; the word deep seems appropriate for it emphasizes the distinction from Fuchs' endothelial dystrophy as well as from the other hereditary corneal dystrophies; the word dystrophy conforms better to current ophthalmic usage than does the word degeneration, the latter implying a more progressively disabling course than is the case for this disease.

In this pedigree (fig. 1) the propositus presented herself on referral following a school visual screening test. It was possible to examine all the closely related members of the kinship with the slitlamp and corneal microscope, as well as many of those in the unaffected collateral branch. The two affected individuals in the first involved generation are aged 43 and 44 years. The five affected members in the following generation are from eight to 15 years of age. The unaffected sister of the propositus is three years of age, and the unaffected cousins are between eight and 13 years of age. The parents of the first affected individuals are both deceased. Consanguinity between them is denied by their children.

The general physical condition of each of the affected members as reported by his

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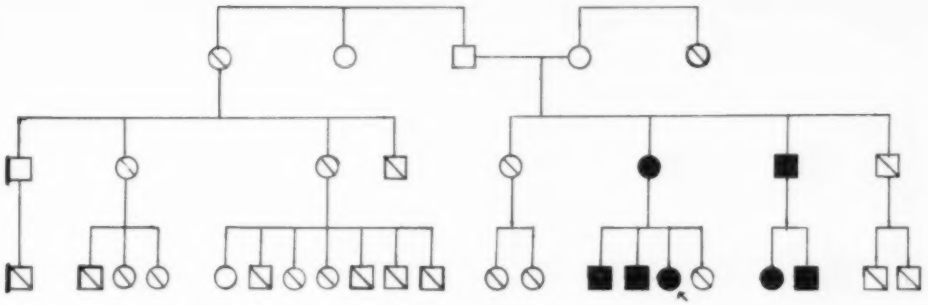

Fig. 1 (Snell and Irwin). Hereditary deep dystrophy of the cornea. Pedigree of the W family. ⊘, examined and found normal.

personal physician or pediatrician is not abnormal, and no other stigmas of familial or congenital disease of any type were found among any members of the affected branch.

Ocular abnormalities other than the inherited corneal disorder were found in three members of the kinship. The elder brother of the propositus exhibited small amounts of calcium deposition in the corneal peripheries characteristic of early band-shaped keratopathy. The woman, aged 70 years, in the first generation of the unaffected branch showed a few Hassle-Henle bodies of the cornea of each eye without endothelial dystrophy.* The woman, aged 88 years, in the first generation of the kindred was found to have severe senile macular degeneration in each eye.

The corneal findings among the affected members of the kinship are so similar that a single description applies to all. Variations from one to another are in the total number of the lesions seen, or in the proportion of vesicular to plaquelike lesions, or in the size of the lesions, but the characteristic pattern and appearance are consistent.

The most characteristic finding is the presence of small bleblike structures situated on Descemet's membrane and protruding into the aqueous (fig. 2). The contents of the blebs are most frequently watery in appearance.

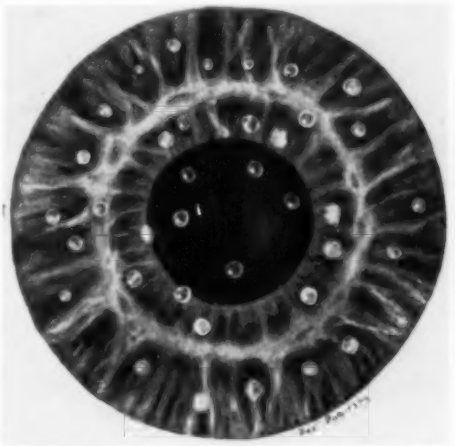

Fig. 2 (Snell and Irwin). Distribution of the lesions in hereditary deep dystrophy of the cornea.

Others of the blebs have cloudy contents, and some of these are surrounded by a faint aura of opacification and flat thickening of Descemet's membrane (fig. 3). Similar, flat, irregularly shaped but discrete areas of opacification of Descemet's membrane are present unassociated with the bleblike structures. One receives the impression that the lesions progress from an initial bullous stage to the stage of flat opacification. In the latter stage the deep stroma just anterior to Descemet's membrane shares in the alterations. The distribution of the lesions is fairly uniform over the entire extent of the posterior corneal surface.

* Dr. Russell Snip, San Antonio, Texas, kindly examined this person.

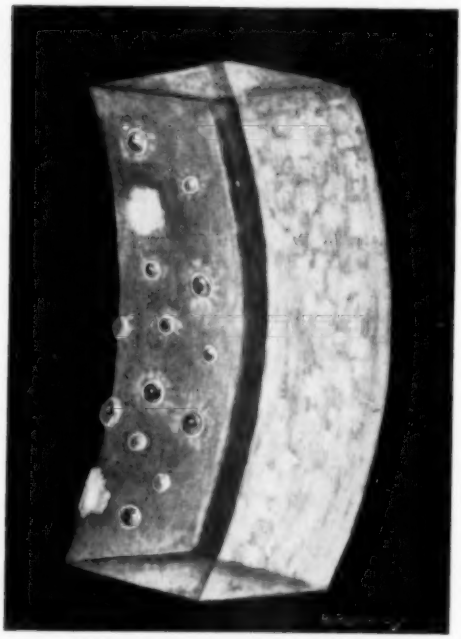

Fig. 3 (Snell and Irwin). Optical section in hereditary deep dystrophy of the cornea.

The visual acuity in the propositus is reduced by the dystrophy to 20/40 in each eye, and in the case of her affected uncle to 20/40 in the left eye. All of the other affected eyes have visual acuity of 20/20, and most of them are free of significant refractive error. No other ocular abnormalities are present. The corneal sensitivity is unaffected.

The only corneal disorder which is likely to be confused with hereditary deep dystrophy is Fuchs' endothelial dystrophy. The characteristic appearance of the two disorders should readily permit their differential diagnosis and a further distinction is the occurrence of hereditary deep dystrophy in children. The distinction is important because hereditary deep dystrophy is nonprogressive, or very slightly progressive. Theodore[3] observed that the disorder was more severe in successive generations. In the present kindred the most severely affected individual, the propositus, has a less affected parent, although her affected cousins have less involvement than their father.

Summary

Hereditary deep dystrophy of the cornea appearing in seven members of a large kindred is described. The disorder is inherited as a dominant characteristic.

260 Crittenden Boulevard (20).

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EPINEPHRINE AND ACETAZOLAMIDE*

In the therapy of the chronic glaucomas

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The ability of topical epinephrine to lower intraocular pressure has been appreciated for more than 50 years. More recently the hypotensive effect of this agent has been demonstrated to result from a prolonged reduction in the rate of aqueous formation. This has been established both by fluorescein turnover studies[1] as well as by repeated tonographic tracings.[2] The use of this agent as an adjuvant to miotics in the long-term therapy of chronic simple and secondary glaucomas has been advocated and proved useful repeatedly.[3-5]

The systemic administration of the carbonic anhydrase inhibitor, acetazolamide, has also been demonstrated to decrease intraocular pressure by a partial suppression of aqueous secretion.[6,7] This drug has likewise proved a valuable addition to miotic therapy in the treatment of glaucoma.

The purpose of the present study was to learn the effects of epinephrine and acetazolamide administered both separately and simultaneously on the rate of secretion of aqueous humor and on the intraocular pressure. It was hoped to elucidate further the mode of action of each as well as to establish the practicability of using both agents together as an effective means of lowering intraocular pressure in glaucomatous eyes.

* From the Department of Ophthalmology and the Oscar Johnson Institute, Washington University School of Medicine. This investigation was supported in part by a research grant to the Department of Ophthalmology from Mrs. Edgar M. Queeny. The research relating to this study was also financed in part under a grant to Washington University School of Medicine made by the Alfred P. Sloan Foundation, Inc. The grant was made upon recommendation of the Council for Research in Glaucoma and Allied Diseases. Neither the foundation nor the council assumes any responsibility for the published findings in this study.

Methods

Forty-five eyes of 23 patients were studied: Five eyes in three patients with chronic secondary glaucoma and 40 eyes of 20 patients with chronic simple (open-angle) glaucoma. All patients were receiving pilocarpine therapy and this was continued without change during the study. First, 22 patients (41 eyes) were treated with acetazolamide. After pressures were stabilized at new levels topical epinephrine was added to their therapy. Second, 20 eyes were treated with topical epinephrine and when intraocular pressures reached stable levels these 10 patients were given acetazolamide systemically.

The epinephrine was made up as a 4.5-percent solution of the bitartrate in bisulfite as follows:

Epinephrine bitartrate	90 mg.
Sodium bisulfite	10 mg.
Sodium chloride	5 mg.
Chlorobutanol	10 mg.
Distilled water	2 ml.

It was kept in a cool dark place (refrigerator) and was administered to all patients as a single drop in the conjunctival sac of the affected eye or eyes once a day at bedtime. The application was accompanied by transient burning and irritation of the eye but was tolerated by all patients in the series. No instance of pupillary dilatation was observed and no systemic side-effects were noted. Acetazolamide was administered orally in doses of 250 mg. every six hours.

Tonography was performed on all patients with an electronic tonometer connected to a Leeds and Northrup recorder. The 1955 Friedenwald tables were used for determination of outflow facility and intraocular pressure.[8] Flow was calculated as-

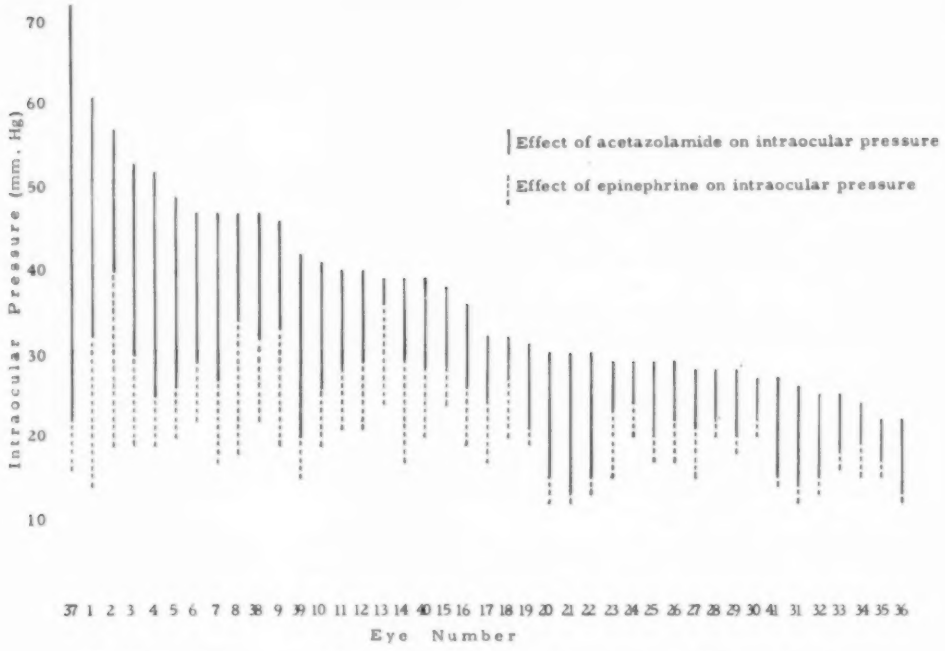
Intraocular Pressure (mm. Hg)
70
60
50
40
30
20
10
Effect of acetazolamide on intraocular pressure
Effect of epinephrine on intraocular pressure
37 1 2 3 4 5 6 7 8 38 9 39 10 11 12 13 14 40 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 41 31 32 33 34 35 36
Eye Number

Fig. 1 (Becker and Ley). Effect of acetazolamide and acetazolamide plus epinephrine on intraocular pressure of glaucomatous eyes.

suming an episcleral venous pressure of 10 mm. Hg. The values used for intraocular pressure and outflow facility were averages of three or more tonographic readings at intervals of 24 hours to three weeks while on the particular single drug or combination of medications.

Results

A. The effects of acetazolamide

The addition of systemic acetazolamide to the pilocarpine therapy produced a fall in intraocular pressure in the 41 eyes so treated ranging from 5.0 to 50 mm. Hg (average 13.0 mm. Hg) (fig. 1). The decrease in intraocular pressure was not associated with alteration in outflow facility and thus resulted from a significant change in rate of aqueous formation from 2.0 ± 0.7 (S.D.) cu. mm./min. to 1.0 ± 0.4 (S.D.) cu. mm./min., a 50-percent inhibition of secretion (table 1).

The addition of acetazolamide therapy in 20 eyes treated with both pilocarpine and topical epinephrine lowered intraocular pressure by an additional 2.0 to 15 mm. Hg (average 7.0 mm. Hg) (fig. 2). The decrease in intraocular pressure was caused by a significant further decline in the rate of aqueous formation from a mean of 1.2 ± 0.4 (S.D.) to 0.6 ± 0.2 (S.D.) cu. mm./min. (table 2). This also represents an additional 50-percent average suppression of aqueous secretion induced by carbonic anhydrase inhibition even in eyes in which aqueous flow was already depressed by epinephrine therapy.

B. The effects of epinephrine

The addition of topical epinephrine to 20 glaucomatous eyes treated with pilocarpine lowered intraocular pressure from 4.0 to 54 mm. Hg, averaging a 13.4 mm. Hg decline (fig. 2). This was accomplished with-

TABLE 1

EFFECT OF SYSTEMIC ACETAZOLAMIDE AND SYSTEMIC ACETAZOLAMIDE PLUS TOPICAL EPINEPHRINE ON RATE OF AQUEOUS FLOW IN 41 GLAUCOMATOUS EYES

Eye No.	Diagnosis	Pilocarpine	Pilocarpine + Acetazolamide	Pilocarpine +Acetazolamide + Epinephrine
1	Chronic Simple	—	1.1	0.6
2	Chronic Simple	2.4	1.2	1.0
3	Chronic Simple	3.0	1.2	0.8
4	Chronic Simple	2.9	1.5	—
5	Chronic Simple	3.5	1.3	—
6	Chronic Simple	2.6	0.8	0.5
7	Chronic Simple	2.2	1.0	0.7
8	Chronic Simple	—	1.2	0.6
9	Chronic Simple	—	1.2	0.7
10	Chronic Simple	3.1	1.8	1.0
11	Chronic Simple	3.6	1.8	1.0
12	Chronic Simple	—	0.8	0.6
13	Chronic Simple	—	1.6	1.3
14	Chronic Simple	2.3	0.8	0.6
15	Chronic Simple	—	1.6	1.0
16	Chronic Simple	—	1.1	0.7
17	Chronic Simple	2.6	1.4	—
18	Chronic Simple	1.1	0.7	0.6
19	Chronic Simple	1.7	1.1	0.9
20	Chronic Simple	1.2	0.7	0.3
21	Chronic Simple	1.6	0.5	0.4
22	Chronic Simple	1.6	0.4	0.4
23	Chronic Simple	1.0	0.5	0.4
24	Chronic Simple	1.5	0.8	0.8
25	Chronic Simple	2.6	1.5	—
26	Chronic Simple	1.9	1.0	0.7
27	Chronic Simple	1.8	0.9	0.8
28	Chronic Simple	2.3	1.2	0.6
29	Chronic Simple	2.3	0.8	0.6
30	Chronic Simple	—	1.0	0.7
31	Chronic Simple	1.3	0.6	0.3
32	Chronic Simple	1.2	0.4	0.4
33	Chronic Simple	—	0.8	0.6
34	Chronic Simple	1.5	0.9	0.6
35	Chronic Simple	1.4	0.8	0.6
36	Chronic Simple	1.1	0.5	0.3
37	Secondary	1.2	0.5	0.3
38	Secondary	1.5	0.7	0.7
39	Secondary	1.6	0.8	0.6
40	Secondary	2.3	1.3	1.0
41	Secondary	2.6	0.7	0.6
Mean rate of aqueous flow (cu.mm./min.)		2.0	1.0	0.7
S.D.		±0.7	±0.4	±0.2
Change in rate of aqueous flow		—	−50%	−65%

out comparable changes in outflow facility and resulted largely from a decrease in rate of secretion of aqueous from a mean of 1.9 ± 0.5 (S.D.) to 1.2 ± 0.4 (S.D.) cu. mm./min., or 37-percent inhibition (table 2).

In the 41 glaucomatous eyes under therapy with pilocarpine and systemic acetazolamide, the addition of topical epinephrine bitartrate reduced intraocular pressure by 1.0 to 21 mm. Hg, averaging a fall of 6.4 mm. Hg (fig. 1). The decrease in intraocular pressure was associated with a further significant decline in rate of formation of aqueous humor from a mean of 1.0 ± 0.4 (S.D.) to 0.7 ± 0.2 (S.D.) cu mm./min. (table 1). This would correspond to an average of 30-percent additional suppression of aqueous formation by epinephrine in eyes already subjected to carbonic anhydrase inhibition.

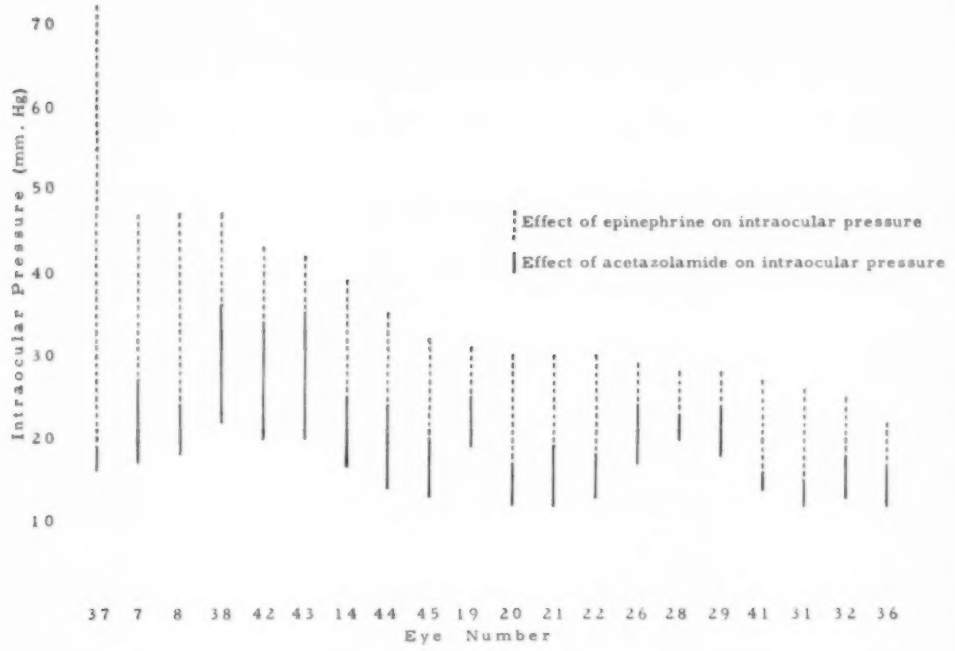

Fig. 2 (Becker and Ley). Effect of epinephrine and epinephrine plus acetazolamide on intraocular pressure of glaucomatous eyes.

Discussion

The partial suppressions of formation of aqueous humor induced by acetazolamide (50 percent) and by epinephrine (37 percent) in this series of patients are in reasonably good agreement with those reported previously.[2,9] It is of considerable theoretical and practical significance that the administration of one of these agents does not appear to impair significantly the effects of the other drug on secretion (as measured by percent change in rate of aqueous flow). Thus, in all eyes in this series which were receiving pilocarpine, the simultaneous administration of both systemic acetazolamide and topical epinephrine resulted in an average suppression of aqueous secretion of 66 percent (tables 1 and 2). It is apparent that additive effects of the two agents directed at the secretory process can be applied to advantage in the therapy of some patients with chronic simple or secondary glaucoma. Their combined use *in addition to miotics* offers attractive possibilities for controlling intraocular pressure even in some glaucomatous eyes which have not responded adequately to either secretory depressant alone. Unfortunately there are individual eyes with chronic glaucoma that fail to respond significantly to topical epinephrine with or without carbonic anhydrase inhibition. Thus far, in selected responsive patients, combined therapy of miotics, epinephrine, and acetazolamide has been continued for periods of up to nine months without progression of glaucomatous damage to the optic nerve or evidence of ocular toxicity. Furthermore, the additive effects of these two agents have provided an exciting stimulus for entertaining speculation as to the mechanisms involved in their alterations of the process of secretion by the ciliary body.

TABLE 2

EFFECT OF TOPICAL EPINEPHRINE AND TOPICAL EPINEPHRINE PLUS SYSTEMIC ACETAZOLAMIDE ON RATE OF AQUEOUS FLOW (CU. MM./MIN.) IN 20 GLAUCOMATOUS EYES

Eye No.	Diagnosis	Pilocarpine	Pilocarpine +Epinephrine	Pilocarpine +Epinephrine +Acetazolamide
7	Chronic Simple	2.2	0.8	0.7
8	Chronic Simple	—	1.1	0.6
14	Chronic Simple	2.3	0.8	0.6
19	Chronic Simple	1.7	1.4	0.9
20	Chronic Simple	1.2	0.8	0.3
21	Chronic Simple	1.6	1.2	0.2
22	Chronic Simple	1.6	0.8	0.2
26	Chronic Simple	1.9	1.5	0.7
28	Chronic Simple	2.3	1.3	0.6
29	Chronic Simple	2.3	1.1	0.6
31	Chronic Simple	1.3	0.6	0.3
32	Chronic Simple	1.2	1.0	0.4
36	Chronic Simple	1.1	0.8	0.3
42	Chronic Simple	2.7	2.0	0.9
43	Chronic Simple	2.9	2.0	1.0
44	Chronic Simple	1.8	1.4	0.6
45	Chronic Simple	2.2	1.4	0.6
37	Secondary	1.2	0.5	0.3
38	Secondary	1.5	1.6	0.7
41	Secondary	2.6	1.1	0.6
Mean rate of flow (cu. mm./min.)		1.9	1.2	0.6
S.D.		±0.5	±0.4	±0.2
Change in rate of aqueous flow		—	−37%	−68%

SUMMARY AND CONCLUSIONS

The rate of secretion of aqueous humor can be suppressed partially by either topical epinephrine (37-percent inhibition) or systemic acetazolamide (50-percent inhibition). These agents are useful additions to miotic therapy in lowering intraocular pressure in eyes with chronic simple or secondary glaucoma. When topical epinephrine and systemic acetazolamide are used together the decrease in rate of formation of aqueous humor is greater than with either agent alone (averaging 66 percent). The additive effect of these two secretory inhibitors affords further opportunities for the control of some of the chronic glaucomas by medical means.

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OVERCORRECTION OF ESOTROPIA*

Following bilateral five-mm. medial rectus recession

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I. Introduction

In a recent review of certain of the case histories of those patients having been examined in the Motility Clinic of the University of California Medical Center, San Francisco, and who had subsequently undergone surgical treatment for esotropia, we were impressed by one rather outstanding fact; one which had been previously noted by Vaughan.[1] This observation was that overcorrection, with resultant exotropia, appeared to be quite prevalent among those cases in which a bilateral five-mm. medial rectus recession had been accomplished. Inasmuch as this procedure was primarily utilized in cases of alternating esotropia, where almost equal vision was present in each eye, we undertook to compare these results with those which had been obtained in a similar group of cases involving bilateral recessions of only four mm. The same arbitrary period of time was chosen, namely the years 1950 to 1954; and, purely by coincidence, 17 examples of each type of operation appeared. Cursory analysis of the postoperative results demonstrated a rather striking incidence of overcorrection in the group of five-mm. bilateral recessions, approximating 40 percent, in contrast with no examples of overcorrection in the four-mm. group.

Obviously, a long-term follow-up on many of these cases is lacking. However, there does seem to be a rather abrupt line of demarcation between the results obtained following an essentially similar procedure utilizing similar surgical technique and involving only a minimal difference as regards the degree of recession. This sharp dividing line prompted us to investigate the matter further inasmuch as it appeared that there might exist a theoretic boundary beyond which one could not safely venture without the risk of resultant overcorrection. This concept is certainly not new, but in view of the dramatic difference in the over-all results obtained in these two series of cases, there would seem to exist sufficient cause for a re-evaluation of the many factors which are involved. There is also a rationalization for presenting a review of the surgical treatment of esotropia generally, including a discussion of the more popular procedures which are employed therefor.

II. Choice of operative procedure

Before presenting an analysis of the series of cases which have been reviewed, it would seem desirable to discuss briefly the various operative procedures which are currently employed in the surgical treatment of esotropia in general and alternating esotropia in particular. In this manner, some basis of comparison between these results and those of other authors may be established.

As reported by Philps,[2] the first documented operation for strabismus of any type was that performed by Diffenbach in 1839. In this case, a medial rectus muscle was completely severed in an individual possessing convergent strabismus. Following the original performance of this procedure, many

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free tenotomies of the medial rectus were accomplished on numerous esotropic individuals, but the operation soon fell into disrepute both because of the high incidence of resultant exotropia, as well as the poor cosmesis which occurred due to posterior displacement of the caruncle.

About the turn of this century, it was generally felt that the medial rectus muscle itself should not be surgically attacked but that the relative position of the globes should be altered by approaching only the lateral rectus muscles. This solution of the problem was manifestly inadequate in the vast majority of cases.

Jameson[3] first outlined the principles of so-called "muscle recession" in 1922. Basically, this operation is a free tenotomy, resulting in retraction and subsequent weakening of muscular action but possessing the important difference that there exists a fixed, measurable, and relatively reproducible endpoint. In 1931, Jameson[4] elaborated on his previously described technique, and was then also able to provide somewhat more precise data equating the actual degree of recession which should be accomplished, and the results which one might expect therefrom. He also pointed out that the suturing of the recessed muscle directly to the sclera, a practice which had theretofore been condemned as rather dangerous, was, in fact, quite innocuous provided that certain technical precautions were observed by the operator.

At the present time, most ophthalmologists seem to agree that a recession of one medial rectus muscle, either alone or in combination with a simultaneous attack on its fellow, or upon another muscle, is the primary surgical procedure which should be employed in esotropia. Of course, there are a few notable exceptions to this generalization. As an example, Dunnington and Regan[5] have stated that in those cases of alternating esotropia where heteronymous fixation is found to exist, the procedure of choice should be bilateral resection of the lateral rectus muscles, inasmuch as overaction of the medial recti may not be the primary causative factor. Gibson[6] considers that early cases of alternating esotropia require bilateral marginal myotomy of the medial rectus muscles according to the method originally described by Chavasse.[7] Similarly, Martin-Doyle[8] states that Chavasse's marginal myotomy is the preferred procedure where alternating esotropia of less than 20 degrees may exist.

Generally speaking, however, any debate relative to the choice of a surgical procedure centers less around whether or not to recess a medial rectus muscle than to what degree it should be recessed. Also, discussion is involved with what muscle, or muscles, should be attacked at the same time, should more extensive surgery be felt necessary.

Where the squint is predominantly monocular, with customarily diminished visual acuity in the nonfixing eye, a recession of the medial rectus muscle of the amblyopic eye, either alone or in combination with a resection of the lateral rectus muscle of the same eye, is the usually accepted procedure. In those instances where alternating esotropia may be the diagnosis, the choice of technique is not so readily determined.

Costenbader and Bair[9] have recommended simultaneous binocular surgery in the latter case, namely a bilateral recession of the medial recti. They feel that this operation is to be preferred over a monocular procedure consisting either of single recession or recession-resection; and this, because of the resultant incomitance which they discovered subsequent to approximately 50 percent of attacks on one eye alone. They have stressed the importance of postoperative comitance in achieving a successful end-result, other factors involved being normal retinal correspondence and parallelism of the visual axes. These authors were impressed, as well, by the increased incidence of facial asymmetry (proptosis, enophthalmos, and so forth), which seemed to follow monocular surgery.

Chandler[10] has also advocated either bilateral medial rectus recession or recession of a single medial rectus in combination with

resection of the *contralateral* lateral rectus, in preference to recession-resection performed on a single eye. He feels that the latter procedure not infrequently results in a residual esotropia for near together with an exotropia for distance.

The arguments in the favor of monocular recession-resection are those which have been well stated by Schlossman and Shier,[11] as well as by Sugar.[12] These are that, although bilateral recession is to be preferred from the cosmetic standpoint alone, recession-resection is possessed of considerably greater flexibility. The fact is emphasized that, should further surgery prove necessary, this can be accomplished on an untouched eye, and the surgeon may then be guided relative to the extent of the operation by the results obtained following the original procedure. The conclusion, then, is that this advantage, together with a strictly practical one relating to monocular dressings, more than compensates for the admittedly superior cosmesis which the simultaneous binocular procedure provides.

The importance of the near-point of convergence (NPC) in determining the type of procedure which is to be employed has also formed the background for considerable argument. Burian[13] feels that the degree of convergence is of little or no prognostic value, his hypothesis being that the medial rectus muscle is a relatively strong one, and should be always able to function adequately in convergence, assuming, of course, that sufficient mental stimulus is provided. His concept depends upon the premise that the goal of muscle surgery is only that of altering the anatomic position of the globe with respect to the orbit, and that any choice of which muscle is to be attacked can be predicated upon what overaction, or underaction, they may demonstrate during monocular rotations. He has not, however, extended this thesis to the logical point of equalizing rotations between both eyes, and, in fact, has stated that bilateral medial rectus recessions, as an example, almost always lead to overeffect.

Quite the opposite view as regards the matter of convergence has been upheld by Dunnington and Regan.[5] They stress the not inconsiderable importance of the near-point of convergence in the preoperative evaluation of any individual case. Post[14] has similarly stated that bilateral medial rectus recession should be performed only in those cases of alternating strabismus wherein excellent convergence is found to be present. Scobee[15] was quite specific in stating that, were the near-point of convergence in excess of 50 mm. as measured from the bridge of the nose, simultaneous recession of the medial recti should not be accomplished no matter what degree of deviation might exist.

In general, we adhere to the practice of "symmetrical surgery," in those cases where visual acuity and monocular rotations are about equal in the two eyes. The near-point of convergence is determined insofar as may be practicable but because of the many inaccuracies encountered in its measurement, particularly as regards infants and children, it does not play a major role in our choice of the surgical procedure to be employed. Somewhat arbitrarily, the degree of recession is based upon the degree of preoperative strabismus, and is equally divided between the two eyes. Interestingly enough, however, the analysis of the cases studied shows that there existed a slightly greater preoperative deviation in those subjected to a bilateral four-mm. recession, than in those undergoing the five-mm. procedure.

III. Case summaries

Table 1, listing bilateral four-mm. recessions, shows a total of 17 operated patients with an average age of three years. The original deviation averages approximately 50^{Δ}, with a resultant correction of 30^{Δ}. This represents an alteration of the position of the visual axes of about 3.8^{Δ} per mm. of recession. The postoperative deviation there-

TABLE 1

BILATERAL FOUR-MM. RECESSIONS (1950–1954)

1. Number of cases	17
2. Patient age	Min.—1 yr. Max.—3 yr. Aver.—3 yr.
3. Average original deviation	49.4Δ
4. Average total correction	30Δ
5. Correction per mm. total recession	3.8Δ
6. Correction per prism diopter original deviation	0.68Δ
7. Instances of overcorrection	0.0

fore approximated 20Δ of esotropia, which represented an excellent cosmetic result. There were no instances of surgical overcorrection.

Table 2, showing the five-mm. bilateral recession group of cases, lists an equal number of individuals with almost the same composite age, 3.8 years. Their average original deviation was slightly less, about 42.6Δ, but the correction obtained was 47.5Δ, obviously resulting in overcorrection with exotropia. The correction per mm. of total recession was 4.7Δ, and the diopters of correction per diopter of preoperative deviation was 1.17, as compared with 0.68 for the four-mm. group; slightly less than twice as much. The instances of overcorrection represented about 41 percent of the total.

That our results do not differ greatly from those reported following comparable procedures is shown in Table 3. It can be seen from these data that the over-all effect from surgery is approximately identical, whether

TABLE 2

BILATERAL FIVE-MM. RECESSIONS (1950–1954)

1. Number of cases	17
2. Patient age	Min.—1.5 yr. Max.—8 yr. Aver.—3.8 yr.
3. Average original deviation	42.6Δ
4. Average total correction	47.5Δ
5. Correction per mm. total recession	4.7Δ
6. Correction per prism diopter-original deviation	1.17Δ
7. Instances of overcorrection	7—(41% of total)

TABLE 3

COMPARISON OF RESULTS FOLLOWING OPERATIONS FOR ESOTROPIA

1. Theoretic (bilateral 4-mm. recession)	36.0Δ
2. Theoretic (4-mm. resection—4-mm. recession)	36.0Δ
3. Tour and Asbury (bilateral 4-mm. recession)	30.0Δ
4. Tour and Asbury (bilateral 5-mm. recession)	47.5Δ
5. Dunnington & Wheeler[20] (10-mm. resection—4-mm. recession)	40.0Δ
6. Cordes and Aiken[28] (O'Connor cinch—4-mm. recession)	41.0Δ
7. Sugar[12] (4-mm. resection—4-mm. recession)	40.0Δ
8. Scobee[15] (bilateral 6-mm. recession)	47.0Δ

bilateral medial rectus recession or monocular recession-resection has been employed. It is also evident that there is some correlation between observed results and the amount of correction which might be predicted on theoretical grounds alone. The basis for the latter statement will be discussed subsequently.

IV. Discussion

Analysis of our series of cases, although admittedly small in number, nevertheless furnishes a basis for discussion. It also suggests certain conclusions, some of which seem to be in conflict with other thoughts which have been expressed on the matter.

Scobee[15] maintained that the degree of correction which could be obtained by means of the recession operation, or for that matter any muscle operation, was independent of the extent of surgery; that it was predicated solely upon the degree of original deviation. Faithfully adhering to his basic premise, he performed recessions of six mm. only. Prangen[16] was equally specific when he stated that all of his recessions were five mm., no more and no less. O'Brien[17] permitted somewhat more flexibility when he advocated recessions of not less than four mm. but not more than six mm.

The diametrically opposite stand to Scobee, Prangen, and others has been taken by those individuals who feel that there must

be an exact and almost invariable relationship between the degree of surgery and the amount of correction. This group of authors also minimize the anatomic and physiologic differences between individual patients. However, in prescribing procedures to the exactitude of perhaps 0.5 mm., they also ignore variations in surgical technique, not only between different individuals, but by the same individual on successive performances. In this vein, Kunz[18] has derived a formula from which the alteration in the position of the globe can be accurately computed subsequent to a given amount of tendon displacement, provided, however, that certain physiologic characteristics of the involved muscles are known. Fisher[19] has provided us with another formula by which it can be determined whether or not a recession, or possibly a recession-resection, is the operation of choice.

On logical grounds, it would seem that there must be a middle ground in this discussion. The degree of correction following surgery cannot reasonably be solely dependent upon the original deviation. This is indicated by the fact that, while the original deviation in our four-mm. series averaged slightly higher than that in the five-mm. group, the correction per mm. following the latter procedure was greater by about 25 percent.

It is no doubt true, as Schlossman and Shier[11] have mentioned, that there is no direct arithmetic or geometric relationship which exists between the preoperative degree of deviation and the amount of surgery which is required in any given case. However, it is also probable, as Sugar[12] has stated, that although any such relationship may show considerable variation between individuals, there exists a general pattern which correlates the degree of preoperative deviation and the amount of required surgery.

On this basis, Sugar[12] evolved a table which may be used as a guide in the performance of strabismus operations. It is interesting to note that our results following a bilateral four-mm. recession compare quite closely with those he reported after the recession-resection operation; that is, approximately 3.6$^{\Delta}$ per mm. Our average total correction from a bilateral five-mm. recession, 47.5$^{\Delta}$, compares favorably with that reported by Scobee[15] after a bilateral six-mm. recession.

Dunnington and Wheeler,[20] on the other hand, obtained an average correction of only 1.8$^{\Delta}$ per mm. for unilateral four-mm. recessions; they did not perform bilateral recessions because of their concern relative to the supposed effect on convergence. This apparent inconsistency is probably due to the existence of lesser original deviation in their series of cases, plus the more-or-less accepted fact that a greater degree of surgery usually results in an increasingly greater correction per mm. of recession.

Another pronouncement which our statistics might refute is that the procedure of bilateral recession, per se, necessarily results in high percentages of overcorrection. This statement is probably true only if a certain safe limit is exceeded, and it would appear that this lies in the vicinity of four mm. per muscle. Naturally, variations in surgical technique among individual operators will serve to alter the exact figure to a certain degree, but the basic fact remains that there is a physiologic maximum. If the amount of surgery is held to within this limit, it would appear that bilateral recession is about as effective as monocular recession-resection. The former provides, in addition, advantages of maintenance of comitance, as well as improved cosmetic results. The danger of surgical overcorrection is probably minimal.

Costenbader and Bair[9] have stated that the function of convergence is no poorer following a conservative bilateral recession than subsequent to recession-resection. The obvious hesitancy of many surgeons to utilize bilateral recession seems to be based to a large degree, therefore, on the discouraging results which are usually obtained subsequent

to attempts to obtain large amounts of correction.

V. Etiology of overcorrection

The underlying cause of the overcorrections which were obtained in our series of bilateral five-mm. recessions might be related to any one, or to a combination of, the various mechanical factors which are involved in the outcome of any operation on the extraocular muscles. These factors include surgical technique, postoperative changes secondary to surgical trauma, and also the basic anatomic relationships between orbit, globe, and extraocular muscles.

From the standpoint of technique itself, there were no basic differences between the two groups of cases. Obviously, it is impossible to compare directly our results with those obtained in the following of other techniques. Admittedly, it is almost as difficult to reproduce identical degrees of recession in successive cases, despite the utilization of identical techniques as may be performed by the same operator. However, the statistical data presented, as well as that found in a review of the available literature, indicates a somewhat greater correspondence in the over-all result than one might be led to expect.

The effect of postoperative adhesions, slippage of insertions, and so on, as they may regard the ultimate position of the eyes has been analyzed by Gifford.[21] He was able to demonstrate that recession, in the average case, produced a new muscle insertion either at, or very close to, the location of the scleral sutures. In those instances where muscle bands became adherent to the sclera behind the point of suturing, thereby causing limitation of adduction with resultant over-effect, a simultaneous shortening procedure on the homolateral lateral rectus had been accomplished. Gifford's observations indicate that there is a greater probability of overcorrection subsequent to recession-resection than after recession alone, provided that safe limits for the latter procedure are not exceeded.

It would appear, therefore, that the primary factors relating to surgical technique and postoperative complications play little or no part in a determination of the over-all result as regards overcorrection. The only other strictly mechanical factors which have not been discussed are those related to the inherent action of the muscles themselves, and to the effects which follow any alteration of their insertions on the globe.

Assuming a given stimulus is present, the rotational ability of the extraocular muscles results from a combination of the actual contractive force of the muscle itself, together with the direction of muscle action with respect to the center of rotation of the globe. The ultimate purpose of any muscle operation, then, is to so alter either one, or both, of these components to the point that the over-all capability of the muscle to produce ocular rotation is either enhanced or reduced, depending upon which may be desired.

Lancaster[22] logically stated that in estimating the amount of "shortening" or "lengthening" which may be required to produce any given shift in the axes of the globe, it should be kept in mind that not only is the operated muscle itself affected but also is its direct antagonist, and to approximately equal degrees.

This concept is based upon the fact that a muscle, ocular or otherwise, develops maximal tension only when it begins contraction at its normal resting length. The contractive ability of muscle tissue diminishes rapidly as the fibers are allowed to shorten to lengths less than that of rest. By the same token, fibers which are stretched to greater initial lengths than those of rest tend to show a slight increase in inactive tension, but a corresponding decrease in their potential for the development of active tension. Lloyd[23] has presented an informative illustration of these phenomena showing quite clearly the

respective effects of initial contraction or stretching on muscle activity.

If, therefore, the medial rectus should be recessed by any given amount, it becomes relatively weaker than its direct antagonist, which is the lateral rectus. The result, then, is outward rotation of the globe, with consequent stretching of the medial rectus and an increase in its resting tension. At the same time, however, the lateral rectus is undergoing contraction and its effective power is becoming less. Equilibrium is again reached when the force supplied by each muscle becomes approximately equal; or, stated differently, when the over-all length of each muscle has been decreased by the same proportion. The net result of a single recession, then, is rotation of the globe to the extent of about one-half the amount of the recession. Further, since both the operated muscle and its antagonist have both contracted to less than their original resting lengths, they have each been weakened insofar as their maximal effective contractibility is concerned.

Unfortunately, it is only too true that these theoretical prognostications seldom agree with actual results in individual cases. This is true partly because we have ignored any differences in elasticity between agonist and antagonist, and also because we have disregarded the effect of such anatomic variants as check ligaments and aberrant muscle attachments. In addition, we have not considered the secondary actions of the various other extraocular muscles, which play a not inconsiderable role in determining the final result, particularly so where large degrees of correction have been attempted. The anatomic differences between individuals have apparently led some authorities toward complete disregard of the basic physiologic aspects involved in the subject of muscle surgery. However, the fact remains that following relatively small degrees of attempted correction, the globe does shift by approximately the theoretical amount.

So far, we have considered only that portion of muscular effect which is related to inherent contractibility or elasticity, and we have not considered the sequelae of an alteration in direction of action. In the case of the medial rectus, as will be shown, the latter factor may be of considerable importance. It is obvious that the maximum rotatory effect (torque) of any force is developed when its direction of action lies along the tangent to its point of contact; in other words, when its action is normal to the radius drawn to the point of contact. Should the direction of the force be changed so that it is no longer tangential to the contact point there results a corresponding decrease of torque.

The degree to which this occurs can easily be calculated by means of vector analysis, if the total force is represented as being the resultant of two components. One component acts tangentially, producing maximum torque; the other acts normal to the first, along the direction of the radius to the point of contact, and produces no torque. The actual lengths of the three vectors represent the respective forces of each component, and their magnitudes can be computed following elementary trigonometric laws (figs. 1, 2, and 3).

Because of the "wrap-around" relationship

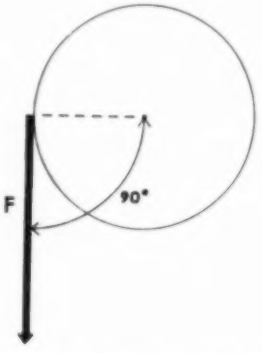

Fig. 1 (Tour and Asbury). Force "F" acting *normal* to radius to point of contact. Maximum torque.

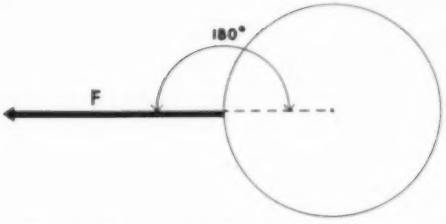

Fig. 2 (Tour and Asbury). Force "F" acting *along direction* of radius to point of contact No torque.

of the extraocular muscles with respect to the globe, resulting in the placement of their insertions somewhat anteriorly to their point of tangential contact, a relatively small change in the position of the eye, following rotation, nevertheless enables the muscles to act with little or no alteration in their orientation with respect to its center of rotation. However, should their insertions rotate to a point posterior to the original tangential point of contact, the direction of the applied force begins to change. An individual muscle can no longer act with maximum torque, and proceeds to lose mechanical advantage at an increasingly rapid rate.

It has been traditionally stated that no muscle should be recessed behind the equatorial plane of the globe, the implication being that this represents the tangential point of contact for all of the extraocular muscles. This is a safe approach in the case of the lateral rectus, for example, inasmuch as its point of contact actually lies somewhat behind the equator. That this is not a safe assumption with respect to the medial rectus can easily be shown by a line drawing, to scale, of the anatomic relationships involved (fig. 4). The actual measurements used in this drawing were those furnished by McCotter, Fralick, and Henderson,[24] which agree very closely with those published by Fink,[25] Scobee,[26] Jameson,[4] and Lancaster.[22] Photographs of an ophthalmotrope constructed by O'Connor[27] also prove quite illustrative as regards the direction of action of the various extraocular muscles.

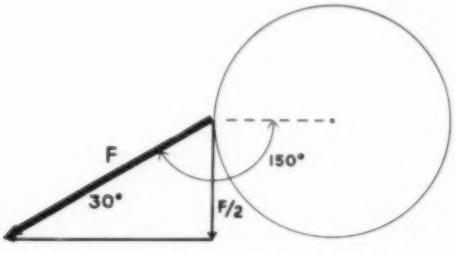

Fig. 3 (Tour and Asbury). Force "F" acting at *150 degrees* to radius to point of contact. Torque component equals F/2.

It can easily be seen from Figure 4 that the direction of action of the medial rectus is not, as has frequently been assumed, parallel to the sagittal plane of the eye. In this drawing, A is the origin of the medial rectus, BCF the equatorial plane of the eye, D the tangential point of contact, E the muscle insertion, G the corneal vertex, and H the limbus. The tangential point of contact is shown to lie anterior to the equator by almost two mm. Consequently, the contact arc averages only about five mm. instead of seven mm., as is usually stated, so that the maximum safe amount of recession is considerably less than that usually stated. Recession of more than five mm. does not allow the muscle to act at peak efficiency in adduction, and, as we have seen, the efficiency diminishes at an increasingly rapid rate as greater degrees of inward rotation are attempted.

Furthermore, if the original insertion is farther back from the limbus than the stated average of 5.5 mm., and this must occur in many cases, a five-mm. recession will not allow the medial rectus to act at maximum efficiency even with the eye in the primary position. Assuming a certain balance of resting tonus to be present between the medial and lateral rectus muscles, the resultant reestablishment of equilibrium greatly favors the lateral rectus; the result is overcorrection and exotropia. Stated somewhat differently, the effect, per mm., of a recession behind the

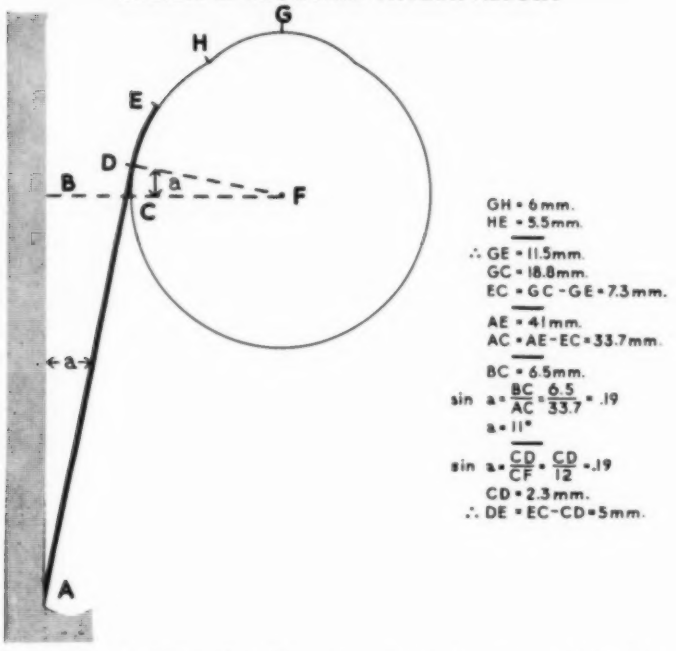

Fig. 4 (Tour and Asbury). Action of medial rectus muscle with respect to globe. Point of tangential contact (D) is anterior to equatorial plane (BCF), resulting in loss of torque should insertion (E) rotate behind (D).

normal point of tangency of the medial rectus tends to alter muscle effectiveness and resultant position of the globe to an alarmingly great degree. Add to this the increased difficulty as regards adduction in convergence, and it is not surprising that overenthusiastic recessions produce so many poor surgical results. While it is true that the recession-resection procedure may also result in greatly weakened adduction, this occurs in only one eye. The maintenance of parallelism of the visual axes in such cases can still be accomplished by increased adduction of the fellow eye, or by head-turning away from the operated side.

VI. Summary and Conclusions

On the basis of these statistics, a review of the literature, and an analysis of the anatomic relationships which are involved, it seems logical to conclude that:

1. The operation of bilateral medial rectus recession in cases of alternating esotropia is a basically sound procedure. It is advantageous from a cosmetic standpoint. It results in a lessened incidence of postoperative incomitance and a correspondingly greater likelihood of functional cure.

2. Overcorrection as a result of this procedure is not the fault of the operation, per se, but results rather from an attempt to recess the medial rectus muscles to a degree which is in excess of that allowable because of anatomic relationships of the medial rectus to the globe.

3. The safe limit of medial rectus recession is in the neighborhood of four mm., a degree which can be determined on theoretical grounds alone, and which correlates remarkably well with the clinical findings which have been presented.

4. In spite of the numerous intangible fac-

tors resulting in wide variations in the outcome of muscle surgery in general, there are certain basic physiologic concepts which cannot be ignored. Their application may result in a considerably greater degree of predictability than is generally assumed.

384 Post Street (8).

Carew Tower (2).

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BILATERAL METASTATIC CARCINOMA OF THE CHOROID

Report of two cases treated with X-ray therapy

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Metastatic carcinoma of the choroid was first described by Perls,[1] in 1872, who found metastatic lesions in each eye at autopsy of a 43-year-old man with a primary tumor of the lung. Since 1872, about 305 cases of choroidal metastasis have been reported. Bilateral metastasis has been more rare, being found in only 25 per cent of the cases.[2, 3] Metastasis to the choroid probably occurs much more frequently than the 305 cases indicate, since the condition often develops late in a generalized metastasis which overwhelms the patient before eye lesions cause symptoms or are noticed by the physician. Study of 4,000 enucleated eyes at the New York Eye and Ear Infirmary pathology laboratory disclosed only 15 cases of metastatic carcinoma of the choroid.[17]

According to Maxwell,[4] the majority of metastatic tumors of the uveal tract are carcinomas, although hypernephroma, malignant melanoma, sarcoma, chorionepithelioma, and teratoma have been reported. Cordes[2] states that 65 percent (Cohen,[3] 70 percent) of the primary tumors are located in the female breast. Giri[5] and Ask[6] believe that 10 to 15 percent are found in the lungs and bronchi. The gastro-intestinal tract account for 10 percent of the primary sites. Godtfredsen[7] expresses the opinion that carcinoma of the lungs gives rise to choroidal metastasis nearly as frequently as carcinoma of the breast. In order to avoid unnecessary lung surgery for carcinoma, he recommends ophthalmoscopic examination in all cases to determine if metastasis already exists.

Location of eye metastases

The majority of eye metastases have involved the posterior pole rather than the iris or ciliary body. Duke-Elder[8] believes this is due to the fact that metastatic emboli have a greater chance of entering the eye through the 20 or more short posterior ciliary arteries than through the two long posterior or five anterior ciliary arteries. The choroid is the site of invasion in most cases but occasionally, the optic nerve and even the extraocular muscles[10] are involved. The left eye is more frequently afflicted, possibly because the left carotid artery branches directly from the aorta, the right carotid from the innominate artery. The time of metastatic occurrence varies greatly, sometimes appearing before the discovery of a primary tumor or developing as long as 17 years[9] after the primary tumor was manifest.

Symptoms

Because the choroid is usually involved, the first symptom the patient notices is loss of vision, either prompt and severe, if the central choroidal area is involved, or slow and gradual, if the peripheral choroid is affected, since peripheral scotomas are not noticed subjectively unless they are large. Involvement of the optic nerve may cause visual impairment quite early due to pressure. Vitreous "soot" floaters or light flashes are not associated with the serous retinal detachments that occur, in contradistinction to the common detachment with a retinal tear. Pain or proptosis of the eye is usually a late symptom. In bilateral cases, at onset of metastasis, both eyes are not often involved at the same time.

Clinical findings

Ophthalmoscopic examination in early cases reveals a small diffuse area of retinal

edema of one to two disc diameters in size; the area is characteristically very flat without much bending of superimposed retinal vessels and with no sharp or discrete boundary or edge. The area is grayish, dull, and slightly mottled in appearance and hemorrhages or discrete exudates are not common.

The retinal elevation or detachment in early lesions is usually less than six diopters and may easily be confused with the edema of central serous retinopathy. In advanced cases, serous elevation or detachment of the retina becames more pronounced and the underlying lesion is more difficult to detect, being hidden by the massive detachment. Since the choroidal lesions are seldom very thick, translumination of the globe is of little value.

Glaucoma appears later than in cases of other intraocular tumors. If similar lesions are found in each eye at the onset, or within several months, a diagnosis of metastasis to the choroid is much more probable. Increased uptake of radioactive phosphorus may also help indicate the presence of a malignant tumor.[11]

Pathology

Cordes states that a typical flat, diffuse, lesion is characteristic of the tumor and is to be expected from the nature of the epithelium and the choroid, varying according to the primary source of the metastasis.

Duke-Elder describes those tumors arising from carcinoma of the breast as consisting of alveoli of various sizes containing large round polygonal cells with single large nuclei with mitotic figuration. Sometimes the stroma between the cells is scanty or may be profuse. The choroid is compressed and slowly degenerates with distintegration of the melanocytes, with resulting dumping of pigment. The rapid growth of malignant cells around vessels of the choroid may cause erosion and subsequent hemorrhage into the growth or surrounding area. Although the sclera may be involved, erosion or extension through the sclera is not as common as in the case of other tumors. The retina is usually elevated by serum two or three mm. in a flat manner instead of the usual bullous detachment with tears.

Prognosis

The prognosis of patients with metastases to the choroid is very poor as to life but good as to saving vision. Widespread metastasis to other organs, such as the brain, has most likely occurred at the same time as the eye metastasis. Early development of serious complications may occur within a few months or be delayed as long as two years (Evans[12]). Patients with unilateral cases usually live somewhat longer than those with binocular cases. Vision, however, may be recovered and maintained at a useful level by treatment. This should be done to afford as much useful vision as possible to comfort these unfortunate persons during their remaining period of life.

Treatment

Radiation treatment of choroidal metastases has been successfully accomplished by Wilmer,[13] Zentmayer,[14] Evans,[12] Lemoine and McCleod,[15] Reese,[16] and Cordes.[2] Early workers used radium applications, radon needles, and, later, X-ray portals which missed the anterior segment as much as possible.

Reese recommends the same method of X-ray radiation that he uses for retinoblastoma, except that the total dose is reduced to 2,000 or 3,000 r. Vision has been reported to be improved by treatment from 20/200 to 20/40 and even to 20/20 (Cordes[2]). Best results come with early treatment but even old lesions can be improved, as will be demonstrated later in this report.

The eye tolerates irradiation in these cases very well. Cordes' patient, who received 3,315 r initially and, at the time of recurrence, 3,356 r additionally, making a total dosage of 6,671 r showed no sign of injury to the lens at death eight months later. With such a short life expectancy, slight involvement of the lens can be disregarded if it

does occur. In general, 3,600 r may be given the lesion initially and repeated when necessary.

Case reports

Case 1

Mrs. Z. R. W., aged 50 years, was seen by Dr. Ralph Stevens in 1947 for refraction. Corrected vision was 20/20, each eye. No pathologic alteration was found. The patient was seen in 1950, 1951, and 1952 for extraocular infections. Vision remained normal.

On August 31, 1953, she complained of blurred vision in the left eye of two weeks' duration. She gave a history of radical mastectomy performed in 1949. Vision was: O.D., 20/20; O.S., 20/400. X-ray evidence of pulmonary metastasis was found in 1952. The patient was given 1,900 r over the ovaries to be followed by androgen therapy. She was seen in consultation by a Portland ophthalmologist (Dr. E. Merle Taylor) who clinically confirmed the diagnosis of bilateral breast carcinoma metastasis to the choroid.

The left fundus disclosed an elevated retina in the nasal inferior quadrant; it appeared flat, dull gray, and extended to the nasal edge of the disc. The right fundus showed a suspicious flat area of retinal edema two disc diameters in size in the inferior nasal quadrant near the disc, with no hemorrhages or exudates. The intraocular pressure was: O.D. 24 mm. Hg; O.S., 25 mm. Hg (Schiøtz).

Over a 15-day period, a total of 5,832 r was given the left eye; 1,944 r each was given through three portals, using 0.5 mm. Cu and 1.0 mm; Al filter with 250 kv., by Dr. C. J. Johannesson (Walla Walla). One month later the corrected vision was: O.D., 20/20; O.S., 20/40. The elevation of the retina in the inferior portion of the left eye had decreased, leaving a few small areas of pigmentation. The patient maintained this visual acuity until her death from metastasis to the liver on December 30, 1953. An autopsy could not be obtained.

Case 2

Mrs. A. C. N., aged 63 years, was treated by Dr. Ralph Stevens from 1937 to 1943 for recurrent episcleritis and phlyctenulosis, with favorable response. The eyes were otherwise normal except for grade 2 vascular changes. Vision was 20/20 in each eye, corrected.

In August, 1953, she reported poor vision in the right eye beginning five months before. Corrected vision was: O.D., 20/100; O.S., 20/20. The right macula showed slight edema, no hemorrhages or exudates. Blood pressure was 190/110 mm. Hg. By 1954, there was a faintly gray macular scar without edema.

In 1955, the left eye became blurred. Corrected vision was: O.D., 20/200; O.S., 20/30. Slight macular edema was evident in O.S. This edema increased, vision fell to: O.D., 20/300; O.S., 20/200, and was not affected by Meticorten® orally. She was seen in consultation by two ophthalmologists who believed this picture to be consistent with macular degeneration.

In June, 1955, a lump appeared at the angle of the left jaw. A history of a left radical mastectomy in 1944 for adenocarcinoma and a right radical mastectomy with excision of the internal mammary chain of nodes in February, 1954, was discovered on questioning. Pathologic diagnosis of the right breast was "adenocarcinoma of the breast, moderately undifferentiated, Grade III with metastasis to the axillary nodes and lymph node along the thoraco-dorsal nerve."

Besides the previous macular lesion, O.D., a new area, two disc diameters in size, appeared to the nasal side of the disc, being elevated about two diopters and of a dirty gray-yellowish color. The left macular lesion appeared denser and dull-gray mottled areas were visible under the retina. Therefore, a diagnosis of bilateral breast carcinoma metastasis to the choroid was made.

The following X-ray therapy was given to both eyes by Dr. H. G. Roberts (Walla Walla):

Lateral 2.0 by 2.0 cm. X-ray portals, posterior to the lens region. June 28 to July 21, 1955, 2,100 r to each eye. August 3 to August 6, 1955, 1,500 r. A 50-cm. distance from target, half value 3.0 mm. Cu 250 kv., 12 ma., and constant potential were used.

The lesions became flatter, darker, and pigmented. The visual acuity improved as follows:

July 12th: O.D., 20/60; O.S., 20/200
August 9th: O.D., 20/60; O.S., 20/50
August 30th: O.D., 20/50; O.S., 20/50
September 6th: O.D., 20/30; O.S., 20/30

Corrected vision of 20/30, each eye, remained until her death October 26, 1955.

Pathology. The anterior segment of each eye was normal. The pathologic changes were in the posterior segment. The posterior choroid of each eye was thickened by a dense matting of hyaline connective tissue (fig. 1). Firmly held within this connective-tissue structure were islands of degenerating malignant epithelial cells suggesting breast origin (fig. 2). In the periphery where the concentration of X-ray changes was less, a few cells, which were definitely malignant, appeared to be viable. The few scattered cells in the posterior choroid showed evidence of degeneration with pink staining shrinking cytoplasm, and nuclei which were partially or completely degenerated (fig. 3). These islands of degenerating cells appeared to be firmly trapped by the secondary growth of hyaline connective tissue. The choroidal vessels appeared moderately sclerosed. The right macula showed evidence of mild macular degeneration. The left macula showed some macular edema. Each retina had the normal number of ganglion cells. Each optic nerve appeared to be normal.

Discussion

Two cases of bilateral carcinoma of the

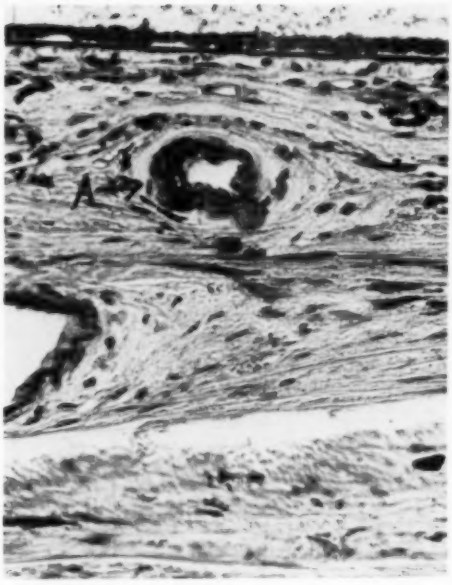

Fig. 1 (Stevens and Reeh). A. C. N., left eye. Choroid, with absence of tumor cells, matting of hyaline connective tissue, and sclerosed vessel (A).

Fig. 3 (Stevens and Reeh). A. C. N., left eye. High-power view, showing tumor cells in a state of marked degeneration (A).

Fig. 2 (Stevens and Reeh). A. C. N., left eye. Matting of hyaline connective tissue, enclosing degenerating tumor cells (A), and sclerosed vessel (B).

breast with metastasis to the choroid were presented. One case was not confirmed by pathologic study but it presented a rather typical picture clinically and responded to X-ray therapy. The metastases became evident in four years in the first case and in nine years in the second. Radiation to the choroidal lesions caused immediate restoration of useful vision in each case.

Histologic studies of one case (*2*) showed the tumor to be replaced with a matting of hyaline connective tissue. The few islands of cells remaining appeared to be trapped in this tissue and were in the process of degeneration (fig. 3). One case demonstrated the value of a thorough history of malignancy or examination for malignancy elsewhere in the body when an attempt is made to evaluate atypical choroidal lesions.

Both cases demonstrated that patients with choroidal metastases from breast carcinoma may derive much benefit from X-ray therapy. This may be especially important in the future when more patients with breast carcinoma may live longer because of advances in chemical and surgical treatment.

Summary

Two cases of bilateral carcinoma of the breast with metastases to the choroid were presented. Each case showed demonstrable benefit from X-ray therapy to the eyes, with rapid improvement in vision which remained until death. Even advanced cases with retinal detachment due to choroidal metastases should receive trial X-ray therapy before enucleation is considered.

308 Baker Building.

Taylor Street Building (5).

The pathologic study in Case *2* was made at the John E. Weeks Ophthalmic Pathology Laboratory, University of Oregon Medical School, Portland, Oregon. Interpretations were by Merrill J. Reeh, M.D., and Leonard Christensen, M.D.

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OPTIC NEURITIS FOLLOWING CATARACT EXTRACTION*

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Over the years we have been impressed by the occasional occurrence of an optic neuritis from six to 12 weeks after a cataract extraction. We have now a sufficient number of cases (17) to present this complication as an entity. Nine of our cases have come under our personal observation and the others have been reported to us by colleagues (Dr. Manlon Easton of Boston, and Dr. John Dunnington, Dr. Gordon Bruce, Dr. Herbert Katzin, Dr. Edward Norton, and Dr. Bernard Kronenberg of New York).

There is very little to be found in the literature on this subject. In 1951, Townes, Moran, and Pfingst[1] mentioned four cases of optic neuritis, one of which may belong to this group. In 1955, while our study was progressing, Easton presented before the alumni meeting of the Massachusetts Eye and Ear Infirmary a case report involving both eyes which were affected in the manner we are discussing, and these two eyes are included in our series.

The onset of the papillitis occurred, on the average, from the sixth to the 12th week after the operation. The longest interval after the operation was 10 months.

The usual findings are edema of the nervehead associated with flame-shaped hemorrhages (figs. 1 and 2). In addition, the small arterioles near the disc margin at one

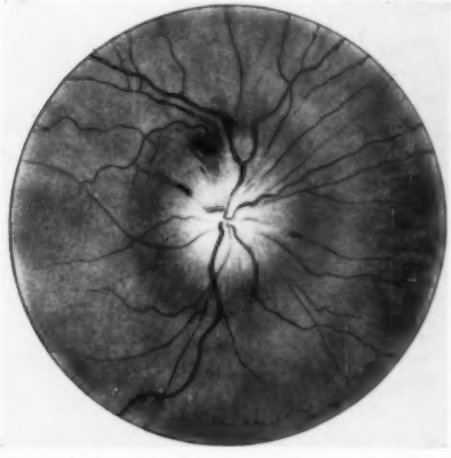

Fig. 1 (Reese and Carroll). Appearance of fundus in optic neuritis following cataract surgery.

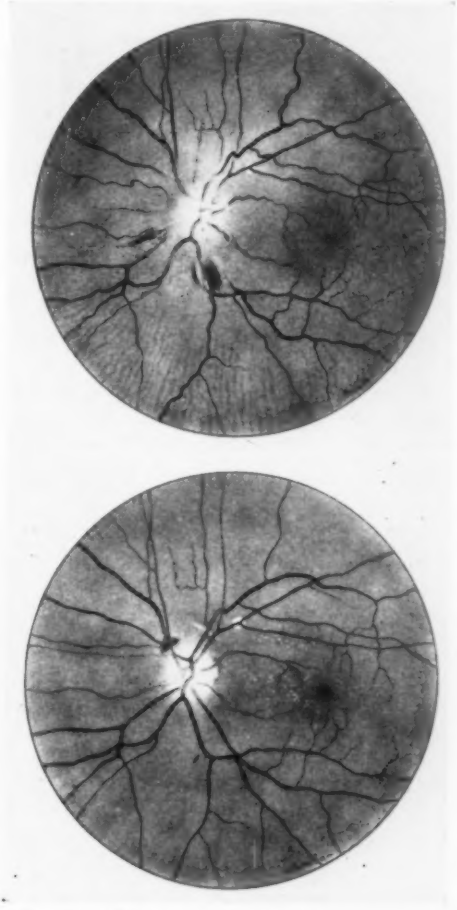

Fig. 2 (Reese and Carroll). Appearance of fundus in optic neuritis following cataract surgery. Lower picture is of the fundus of the same patient six weeks later.

* From the Institute of Ophthalmology of the Presbyterian Hospital.

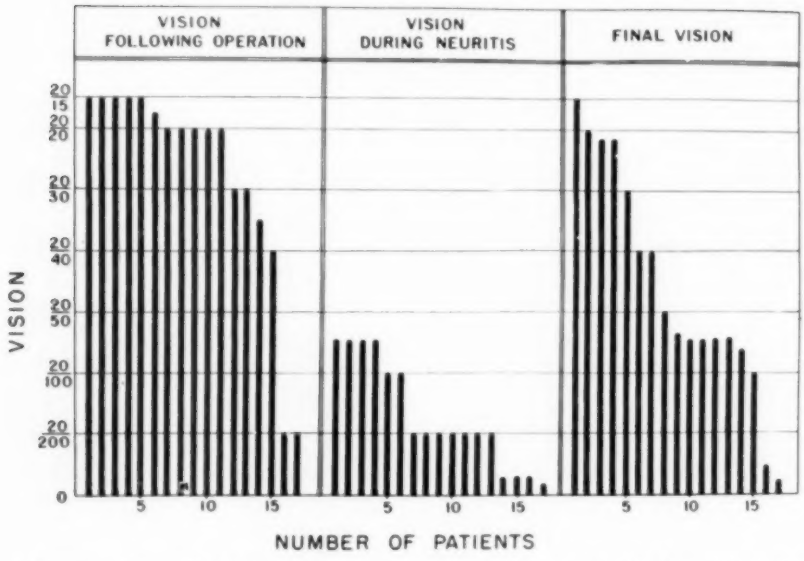

Fig. 3 (Reese and Carroll). Visual findings in patients with optic neuritis following cataract surgery.

or more sites may show atresia and pallor, even to the point of silver-wire appearance, suggesting occlusion.

For one to two months following the operation the visual acuity in the eye is good (usually normal). During the active phase of the neuritis it usually ranged from 20/70 to 20/200 (fig. 3).

The fields in all cases showed a depression of the central vision. This was due to a central scotoma which was five to 20 degrees in size, but often was not pericentral. In one case the scotoma broke through to the periphery, superiorly; in another there was loss of most of the lower half of the field. In addition to having the scotoma plotted on a tangent screen, four patients were tested with Amsler charts and they could plot their own area of central visual impairment.

The intraocular pressure was recorded as measured by the Schiøtz tonometer on seven eyes at the time of onset of the neuritis. It was essentially the same in each eye and within normal limits.

The general physical examination of these patients showed nothing remarkable or constant. The average age was 69 years, the oldest patient being 82 years of age and the youngest 49 years.

There was no uniformity to the type of preoperative sedation. Nine of the patients, however, were sedated more heavily than is usually routine so that they were almost asleep on the operating table. The patients had the usual type of local anesthesia and in only two instances, following injection, was pressure exerted. There were no complications at the time of surgery, such as vitreous loss or orbital hemorrhage.

The duration of the disease is sometimes difficult to estimate. The shortest course was five days during which time the vision improved from 20/100 to 20/30; another from 20/200 to 20/30 in 26 days; and still another from 20/70 to 20/30 in three months.

When a similar cataract extraction was performed on the fellow eye, no complications ensued in seven cases. The fellow eye was not operated on in five cases. A similar neuritis occurred postoperatively in three cases.

In regard to systemic treatment, vitamins

were given in some instances, steroids in four patients, and in one, penicillin injections. There were no indications that these drugs were effective.

At present steroids are used during the acute phase on the basis of some work by Dr. David Cogan of Boston and his group. They have removed and sectioned a portion of the temporal artery of three patients over the age of 50 years who developed optic neuritis of an apparently unknown etiology. The onset of the blindness had not followed cataract extraction and there were no symptoms or signs pointing toward temporal arteritis. However, all three showed the typical histologic changes of temporal arteritis. Since learning of their experience, we have studied microscopically the temporal artery of one such a patient and of two patients with optic neuritis following cataract extraction—all with negative findings except for a very marked degree of sclerosis. As we did not make serial sections it is possible that foci of arteritis were not detected. However, the positive findings in Cogan's three cases may be of considerable significance and would suggest the use of steroids in treatment. The age of our patients, the narrowing of the retinal vessels, the course of the disease, and the final results suggest a possible vascular basis for the condition.

As to the final results in our patients: the optic disc showed some degree of atrophy in eight eyes; atresia or sclerosis (silver-wire appearance) of one or more of the smaller vessels around the disc was noted in three eyes; choroidal sclerosis was mentioned in one. The final vision is shown in Figure 3.

In a differential diagnosis the following conditions should be considered: (1) Ocular hypotony with papilledema (our patients did not have hypotony); (2) optic neuritis due to uveitis (our patients showed no indication of uveitis); (3) optic atrophy due to retrobulbar injection (one of us [F. D. C.] has collected a small series of cases, one of which was his own, that developed almost complete optic atrophy during the month following an apparently uncomplicated cataract extraction; the patient never saw well after the operation, probably due to injury to the optic nerve); (4) macular edema with central scotoma and reduced visual acuity as described by Nicholls[2] (the macular zone in our patients was thoroughly studied but no evidence of change was noted here).

Excluded from our series were several interesting cases—two of Dr. Edward Norton's showed retrobulbar neuritis appearing four to eight months after cataract extraction. There were no objective findings but only a central scotoma. Another, a patient of one of us (A. B. R.), aged 87 years, had a cataract extraction with vision of 20/15 six weeks following surgery. Three years later, at the age of 90 years, she suddenly lost the vision in the operated eye. There was pallor of the disc, and this was interpreted as a vascular accident involving the vessels of the optic nerve and was probably not related to the operation performed three years previously.

Summary

Following an uncomplicated intracapsular cataract extraction optic neuritis may infrequently appear usually from the sixth to the 12th week after operation. The vision after the operation is normal but during the active phase of the neuritis it ranges from 20/70 to 20/200 and this is associated with a central scotoma. Out of 17 eyes involved, the final vision returned to 20/30 or better in only six eyes, and it ranged from 20/40 to hand movements in the remainder, with an average of about 20/50. Ultimately there is some pallor of the nerve and an atresia or sclerosis (silver-wire appearance) of one or more of the smaller arterioles around the disc. Three patients who had both eyes operated on suffered the same complication in each eye, but seven other patients had no complications following operation on the second eye.

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RETINAL LOCAL SIGNS IN HOMONYMOUS HEMIANOPSIA, STRABISMUS, AND NORMAL VISION*

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In ophthalmic textbooks it is widely accepted that "when the eye is in the primary position (the position of physiologic rest) whatever is imaged on the fovea is seen 'straight ahead.'"[18] With the eye in the primary position the "local sign" of the fovea is said to be "straight-ahead"; and the local signs of receptors left and right of the fovea are said to be "right" and "left", respectively.

Usually, authors (for example,[17]) mention that changes in retinal local signs occur in some cases of homonymous hemianopsia and also in strabismus. But these are pathologic conditions, and none of the authors reviewed by me suggests that these pathologic phenomena have implications for the understanding of normal vision.

I shall present experimental evidence obtained with normals which shows that, with the eyes in the primary position, the local sign of the fovea changes frequently as a result of external conditions, that often peripheral points on the retina mediate the experience of straight-ahead, and that the changes in retinal space values observed in hemianopsia are manifestations of a normal visual mechanism. I shall also suggest that the shifts of retinal local signs which occur in strabismus belong to another class of phenomena than the changes observed in hemianopsia.

SHIFTS IN RETINAL LOCAL SIGNS IN HOMONYMOUS HEMIANOPSIA

Frequently hemianoptic patients are not aware of their visual disturbance until misperception of the position of an object for the first time makes them aware of the fact that there is something wrong with their vision. An object appears to be straight ahead and the patient reaches for it, misses it, and discovers that it is to one side of its perceived position. This observation has been made by many hemianoptics, and has been reported by many clinicians.[1, 2, 7]

It was during World War I that the phenomenon was studied under controlled conditions by Poppelreuter[15] in Germany. He studied hemianoptic vision by means of a modified perimeter. A disk, four inches in diameter, was presented briefly in the periphery of the patient's field of vision, and the patient had to reach for it. Normal control subjects never missed this disk; hemianoptic patients missed it frequently. Other investigators[10, 13, 16] made similar observations. Everyone agreed that retinal local signs were changed in hemianoptics, but for a long time no one described a lawful relationship between field defect on the one hand and direc-

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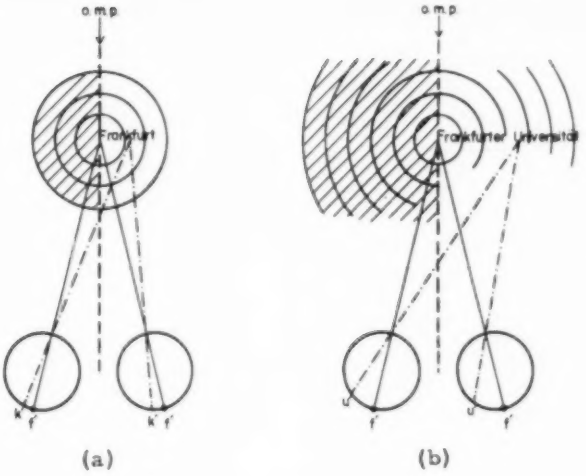

Fig. 1 (Bruell). Displacement of apparent straight-ahead in hemianoptic patients (after Fuchs).

tion and magnitude of change in retinal space values on the other hand.

The first to suggest such a relationship was Wilhelm Fuchs.* Fuchs found that patients with left homonymous hemianopsia would displace perceptually all visual objects to the left, and vice versa. For instance, a patient with left homonymous hemianopsia would perceive the first letter in "Frankfurt" (fig. 1-a) to his left, while a letter closer to the center of the word would appear to be straight ahead. It should be noted that the word is placed in such a position that the first letter in the word lies in the objective median plane (O.M.P. in illustrations) of the patient, that convergence is symmetric, and that the first letter projects on the fovea (f') of the patient.

Fuchs also found that by varying the horizontal extent of the stimulus word he could change the place that appeared to the patient to be straight ahead. If he showed the patient a longer word (fig. 1-b), apparent straight-ahead shifted toward the center of this wider stimulus.

To summarize, Fuchs found that hemianoptic patients misperceive the position of objects placed straight ahead of them. Patients with left homonymous hemianopsia see such objects to the left, while patients with right homonymous hemianopsia displace such objects to the right. The magnitude of these displacements depends on the horizontal extent of the stimulus object. The more the stimulus extends to one side of fixation, the greater the perceptual displacement to the opposite side.

Expressed in terms of local signs, in the situation diagrammed in Figure 1-a, the fovea (f') has the local sign "left" while a place in the periphery of the retina (k') has the local sign "straight ahead." In Figure 1-b, with the stimulus word extending more to the right of fixation, the local sign of the fovea is "more left" than in Figure 1-a, and a more peripheral point on the retina (k') has the local sign "straight ahead." The question arises whether these changes in retinal local signs observed in hemianoptics are pathologic in nature, as most authors imply, or whether similar phenomena occur in normals.

Shifts in retinal local signs in experiments with normals

While working with subjects with normal vision, I made certain observations which shed light on what happens in hemianoptic

* An English translation of this paper is to be found in[8].

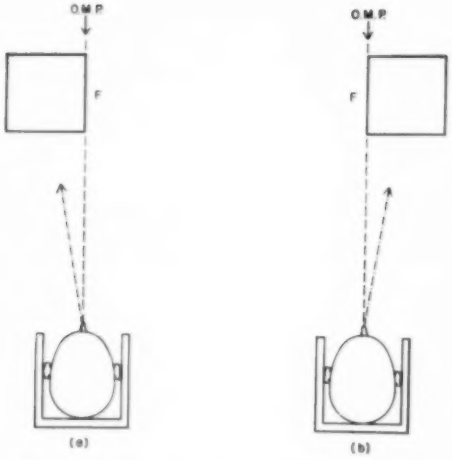

Fig. 2 (Bruell). Effect of asymmetric visual stimulation on experience of straight-ahead.

patients. In further study of observations made originally by Dietzel[6] and by Roelofs,[17] I investigated the effect of asymmetric retinal stimulation on the perception of straight-ahead.[3-5] Examples of asymmetric retinal stimulation are shown in Figure 2. In a dark room a luminous figure is placed with one of its edges in the objective median plane of the subject. The subject is instructed to fixate this edge. Under these conditions the fixated edge of the stimulus figure does not appear to be straight ahead.

In the situation diagrammed in Figure 2-a, the subject perceives the fixated right edge of the figure to his right, and in the situation represented in Figure 2-b he sees the fixated left edge to his left.

The magnitude of these perceptual displacements increases directly with increasingly asymmetric retinal stimulation.[3-5] The greater the peripheral extent of the stimulus figure the greater the displacement. In other words, under conditions of asymmetric retinal stimulation the fovea does not mediate the experience of straight-ahead in spite of symmetric convergence. With the stimulus extending to the left of fixation (fig. 2-a), the local sign of the fovea is "right," and vice versa. The local sign of the fovea becomes "more left" as retinal stimulation becomes more asymmetric. A detailed report of my experimental procedure was published elsewhere.[3]

My findings indicated that even in normals the local sign of the fovea and of other retinal points shifts while the eyes remain in the primary position. Such shifts are caused by asymmetric retinal stimulation.

Discussion

There is a striking similarity between what I found in my non brain-injured subjects and what Fuchs found in hemianoptic patiets. Why this similarity exists is suggested in diagrammatic form in Figure 3. The subject fixates the right edge of a luminous square which is the only object visible in a darkroom field. Under these conditions, only the right occipital lobe receives stimulation, owing to the experimental arrangement. In a patient with right homonymous hemianopsia, on the other hand, only the right occipital lobe responds to stimulation, because of the injury in the other half of the visual system. The net perceptual result, however, is the same. Both our subjects and hemianoptic

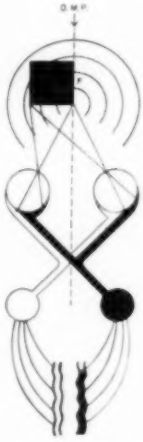

Fig. 3 (Bruell). Schematic representation of asymmetric visual stimulation of the visual system.

patients displace perceptually objects they fixate, in spite of symmetric convergence. The close correspondence of the phenomena occurring in hemianoptic patients and normals appears to be due to the fact that in both cases the retino-occipital stimulation pattern is asymmetric.

I have discussed extensively in other papers the reasons why asymmetric retinal stimulation should lead to changes in retinal local signs. Here I should just like to suggest why, ordinarily, the fovea actually has the local sign "straight-ahead." Under ordinary conditions the visual field does extend symmetrically to both sides of fixation and this is, as I have shown, the one situation in which, with symmetric convergence, the fovea has the local sign "straight ahead." A general rule can be stated as follows: the fovea has the local sign "straight ahead" when both retinal stimulation and convergence are symmetric, or when both are asymmetric. In hemianoptic patients convergence can be symmetric but, because the retino-occipital process is asymmetric by necessity, the fovea does not mediate the experience of straight-ahead when these patients look straight ahead.

For the sake of completeness, it should be added that the same phenomena as observed in the left-right dimension also occur in the up-down dimension. In a darkroom, a fixated luminous horizontal line is displaced downward when another luminous stimulus is added above the line; the same line is displaced upward when a stimulus is added below it. As retinal stimulation becomes asymmetric the apparent position of the foveally projected line changes.[4, 11, 12, 14]

It is important to stress that the described shifts in retinal space values occur almost instantaneously as we have demonstrated elsewhere. For example, the moment a subject opens his eyes and fixates the right edge of the square shown in Figure 2-a, he will see this edge to his right. Therefore it is not surprising to find that the perceptual displacements observed in hemianoptic patients also occur immediately as when the patient sees contours of objects for the first time after injury. I stress this immediacy because textbooks often mention the shifts in retinal local signs occurring in hemianoptic patients in the same paragraph where they mention the shifts in retinal space values observed in strabismus (for example[7]). I argue that these are two entirely different phenomena. In cases of strabismus the process of adjustment which leads from a diplopic condition to a condition of anomalous correspondence takes a very long time, and this is true also of the reverse adjustment process which occurs after operations for strabismus. The patient is very much aware of this slow adjustment process and actively tries to enhance it. On the other hand, the shifts in retinal local signs described above occur as a function of changes in retinal stimulation; they occur all the time, in every one, though we may never become aware of them.

Summary

The paper discussed the widely accepted view that, when the eye is in the primary position, whatever is imaged on the fovea is seen straight ahead. As an exception to this rule, textbooks mention changes in retinal local signs which occur in homonymous hemianopsia. It was shown that even in subjects with normal vision the local sign of the fovea and of other retinal points shifts while the eyes remain in the primary position. In normals such shifts occur whenever retinal stimulation is asymmetric, that is, whenever the visual stimulus extends to one side of fixation only. The shifts of retinal local signs occurring in hemianoptics were attributed to an asymmetric retino-occipital stimulation pattern brought about by the injury to one side of the visual system. Shifts of retinal space values occurring in strabismus were considered to belong to another class of phenomena.

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DICUMAROL IN RETINITIS PIGMENTOSA*

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In 1947 at the request of Dr. Derrick Vail, the senior author (D. M. G.[1]) reviewed the literature pertaining to the therapy of retinitis pigmentosa. The number of remedies which had been tried and found "successful" by their authors was legion. However, not a single one of these has stood the test of time.

Since then, one of us (D. M. G.) has employed a great variety of agents experimentally in the treatment of retinitis pigmentosa without visible success. These included the Filatov method, corticosteroid therapy, the melanophore hormone, and vitamin B_{12}. Corticosteroid therapy and the melanophore hormone at first seemed to offer some hope but failed to stand the test of time and repetition.

All ophthalmologists would welcome any therapy which would offer a glimmer of success in this dread disease.

When McGuire's[2] work with Dicumarol in the treatment of glaucoma was first related to use, it was mentioned that one case of retinitis pigmentosa had also been treated with some improvement. One of our patients with retinitis pigmentosa was hospitalized and treated for 10 days, subsequently two other patients were treated for six weeks by their internists; all three without success.

Following the appearance of Leo and Lidman's[3] article in 1955, with the consequent radio, newspaper, and magazine publicity plus scores of phone calls and letters, four

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more patients were treated by us. Again, we were completely without success in a single case.

One patient who had been treated by Leo and Lidman and rated as "successful" was seen by Birge,[4] who considered the "improvement" psychosomatic.

Matthews[5] saw two patients in whom he considered this regimen unsuccessful. One of these who had been considered "successful" by Leo and Lidman was later reexamined by Matthews who found the status of that one patient worse than it was at the pretreatment examination.

Another patient of ours (D. M. G.) was treated elsewhere with Dicumarol, following which she suffered severe bleeding from virtually all orifices without any improvement in vision or fields. We have heard of a scattering of other cases unsuccessfully treated with Dicumarol.

Our patients ranged in age from 19 to 46 years, with corrected visions of 20/40 to 20/15 in at least one eye and with visual fields of from two to five degrees up to fairly good (25 to 50 degrees.) The majority of cases were in the better category. It was our intention to try Dicumarol therapy on presumably good subjects.

Following our admittedly small and unsuccessful series, it did not seem worth while to continue this difficult, expensive, and, at times, dangerous therapy in order to build up a more imposing series. This was especially true in view of the other reports of which we had heard.

We had not planned to report our small series until our attention was called, repeatedly, to a report by Frell[6] who had "encouraging results" in a series of approximately 40 patients under this regimen.

In all of our six cases which followed the six-week regimen, the plan of therapy coincided closely with that outlined and followed by Leo and Lidman, as well as by Frell. The administration of Dicumarol was effective in prolonging the prothrombin activity of the patients' plasma to between 10 to 20 percent of normal. This is equivalent to a prolongation of the prothrombin time to 30 to 40 seconds (Shapiro modification of the quick technique). None of our group exhibited a hemorrhagic diathesis under therapy.

Conclusion

An admittedly small series of patients with retinitis pigmentosa received six weeks of therapy with Dicumarol, with the method advocated by Leo and Lidman.

None exhibited any evidence of improvement objectively or subjectively. We are unable to account for the discrepancy between our poor results and the 80 to 90 percent success reported by two other groups of observers.

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ACUTE GLAUCOMA: AS A COMPLICATION OF GENERAL SURGERY*

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Acute glaucoma occurs in the early postoperative period after general surgery with sufficient frequency to bring the problem to the attention of ophthalmologists, surgeons, and anesthesiologists. In the past year at Montefiore Hospital four such cases were diagnosed out of a total of 3,437 surgical cases operated under general and spinal anesthesia. In none of these four cases did the patient have any awareness of eye trouble before operation. It is possible that other cases occurred where transient acute episodes were missed by the surgeon.

The acute attacks of glaucoma followed excision of a polyp of the large bowel in one case, abdominoperineal resection of the rectum in one case, and cholecystectomy in two cases.

In the cases we observed, the attacks occurred within 48 hours after operation. The patients had red and painful eyes and headaches that caused the surgeon to request eye consultation. All of the patients were over the age of 50 years.

The factors that may have precipitated the attacks should be considered. Atropine or scopolamine are usually given before general anesthesia to reduce the secretions in the airways. It is possible that even the small doses usually employed would cause sufficient pupillary dilatation and angle-closure glaucoma in a predisposed patient.

Laramande[1] et al., in 1951, reported five cases in which acute glaucoma followed the parenteral or oral administration of atropine or scopolamine. Three cases were similar to those we are reporting in that the medication was given before general anesthesia and was followed by acute glaucoma. They blamed this result on the atropine and scopolamine.

Leopold and Comroe,[2] in 1948, reported a study in which preanesthetic doses of atropine and scopolamine were administered to known glaucoma cases. Their cases included chronic simple and secondary glaucoma and none of the acute narrow-angle type. They found the pupil dilated in three of eight cases with atropine and in seven of eight cases with scopolamine.

Ullman and Mossman,[3] in 1950, reported six cases of acute glaucoma precipitated by the oral use of belladonna for intestinal disorders. Five of the six cases were of the narrow-angle type.

A recent report by Schwartz[4] et al. decided that the usual preanesthetic doses of atropine and scopolamine are safe even in glaucoma patients. We wonder whether this advice is justified. This conclusion is based on a study of 14 known glaucoma cases, eight of which were chronic simple and six were narrow-angle types. Of the latter, five had previous iridectomies, so they would not readily respond with acute glaucoma. Only one of the cases was a narrow-angle type without iridectomy. It is this type that should be studied extensively. All of our cases, as well as Laramande's, developed the acute type of glaucoma after surgery.

General anesthesia, especially ether, causes, in the early stages, contraction of the pupils, while in the deeper stages mydriasis occurs. This brings the angle-block mechanism into play.

Succinylcholine has recently become very popular with anesthetists as it has muscle-relaxing powers similar to curare. However, its use causes a rise in intraocular pressure, as reported by Hofman[5] et al. in 1952 and confirmed by others.[6, 7] This rise in tension apparently is caused by strong sustained contraction of the recti muscles. Two of the cases in this report received succinylcholine.

Another factor is the excitement of hos-

* From the Department of Ophthalmology, Montefiore Hospital. Read in part before the New York Society for Clinical Ophthalmology, May, 1957.

pitalization and surgery, which may precipitate an attack of acute glaucoma.

In the postoperative period the patient is usually kept in semidarkness which may act as a dark-room test does to dilate the pupils and block the angle of the anterior chamber. The acute attack of glaucoma is neglected for some time in these patients. Nausea and vomiting are usually blamed on the original disease, the operation, and anesthesia. Postoperative sedation may make the patient less aware of the locus of his difficulty. In the four cases that came under our care at Montefiore Hospital, there was an interval of one to two days between the probable onset of the acute glaucoma and the diagnosis.

The treatment is essentially the same as for any other case of acute glaucoma. Local pilocarpine and eserine and systemic acetazolamide have usually ended the acute attack. However, it was necessary to operate on one of the patients after medical therapy failed.

It is suggested that, as a prophylactic measure, a drop of pilocarpine hydrochloride (two percent) be instilled in the eyes of all patients just before they are anesthetized. This should be repeated for the next two days at eight-hour intervals. This measure cannot be expected to be infallible but it is likely to reduce the incidence of acute glaucoma.

Case reports

Case 1

E. M., a 55-year-old man, was admitted on March 19, 1956. The patient had bright red rectal bleeding and generalized abdominal pain of 20 hours' duration. A polyp had been removed from the rectum eight years before at Presbyterian Hospital. Three years before this, the patient had been admitted to New York Hospital for bronchial asthma and at that time a barium enema revealed a questionable polyp of the transverse colon.

On April 9, 1956, under spinal anesthesia, a polyp was excised from the splenic flexure. Premedication for the operation included pentobarbital (1.5 gr.), demerol (100 mg.), and scopolamine (0.015 gr.). An additional 50 mg. of demerol were given during the surgery. Spinal anesthesia was administered between the fourth and fifth lumbar interspaces starting at 10:22 A.M. The operation began at 10:32 A.M. and was completed at 12:15 P.M.

On April 10th, the day after the operation, a note on the patient's chart stated that the patient had slight wheezing at both bases but no moist rales. Temperature was 100.4°F. The abdomen was soft and slightly tender. There were no bowel sounds. Intravenous saline, gastric suction, and bronchodilators for asthma were to be continued. Rx: (1) Ephedrine intramuscular (25 mg., three times daily); (2) aminophylline suppository (three times daily). At 3:00 P.M., according to a further note on the patient's chart, the wheezing had cleared on ephedrine but the patient was complaining of pain in the left eye and headache. There was a redness of the eye, fixation of the pupil, and increased tension. A consultation was requested.

The ophthalmologist found the ocular tension elevated in both eyes, 49 mm. Hg (Schiøtz) in the right eye, and 36 mm. Hg in the left eye. The diagnosis of acute bilateral angle-closure glaucoma was made. Pilocarpine hydrochloride (two percent) was instilled in both eyes every 10 minutes. At 7:15 P.M. of the same day, the ocular tension was reduced to 20 mm. Hg in the right eye and 17 mm. Hg in the left eye. Pilocarpine was continued during the hospital stay. The patient was discharged with his surgical wound well healed and his eyes in good condition.

Case 2

Z. G., a 59-year-old married woman, had a 15-year history of intolerance to fatty foods and frequent attacks of right upper quadrant pain. She was admitted to the hospital for cholecystectomy on April 1, 1956. Examination of the abdomen revealed tenderness in the right upper quadrant. The lower border of the liver was palpable two fingers' breadth below the right costal margin. Chest X-ray films and electrocardiogram were normal. The blood count, blood urea nitrogen, and blood sugar were within normal limits.

Following medical consultation, a laparotomy under general anesthesia was performed on April 2nd. The pathologic diagnosis was adenocarcinoma of the gall bladder.

The preoperative medication included pentobarbital (1.5 gr.), demerol (75 mg.), and atropine (0.067 gr.), administered at 9:00 A.M. Anesthesia was administered by endotracheal tube and consisted of pentothal, cyclopropane, and ether. The anesthesia began at 10:05 A.M., the operation began at 10:35 A.M., and was completed at 11:20 A.M.

On April 4th, in her second postoperative day, the patient developed pain in the left eye, with headache, nausea, and blurring of vision. Questioning elicited the beginning of slight pain in the left eye on the night of April 3rd. Ophthalmologic consultation was requested.

The ocular tension was 21 mm. Hg (Schiøtz) in the right eye and 49 mm. Hg in the left eye. The acute attack was ended within two hours with instillations of pilocarpine hydrochloride (two per-

cent) every 10 minutes in the left eye and 500 mg. of acetazolamide.

The postoperative course thereafter was uneventful, although slight jaundice developed several days before discharge. The patient was discharged April 17th with her surgical wound well healed and her eyes in good condition.

CASE 3

M. O., a 63-year-old white woman, was admitted on July 27, 1955, with a chief complaint of a growth on the anus.

On August 2nd, an abdominoperineal resection of the rectum (Miles procedure) was performed. The preoperative medication included demerol (75 mg.), atropine (0.067 gr.), and seconal (0.75 gr.). This premedication was administered at 7:00 A.M. The patient was intubated under cocaine spray at 8:20 A.M. Pentothal and succinylcholine with nitrous-oxide oxygen and ether were used to induce general anesthesia. The operation began at 8:45 A.M. and was completed 10:35 A.M. The patient left the operating room in good condition. There was a rash several hours postoperative. Benadryl was administered intramuscularly. Recovery from the rash was rapid. The pathologic diagnosis was "poorly differentiated squamous-cell carcinoma of the anal canal, extending into the rectum, perineum, and posterior vaginal wall."

A note on the chart four days (August 6th) after operation said that the patient complained of pain in the left eye. The conjunctiva was slightly injected, more on the medial aspect.

On August 8th, an ophthalmologist called in consultation noted that there was "bilateral acute to subacute glaucoma of both eyes, with steamy corneas and shallow anterior chambers. The pupils were fixed in mid-dilation. Ocular tension plus two to plus three." Later the same day, despite intensive use of pilocarpine hydrochloride (two percent), eserine salicylate (0.25 percent), and acetazolamide (500 mg. and 250 mg. every sixth hour for 24 hours), there was no relief from the acute glaucoma of either eye. The vision was reduced in the right eye to finger counting at five to six feet and in the left eye to finger counting at three to four feet. The tension in the right eye was 49 mm. Hg (Schiøtz), in the left eye 53 mm. Hg.

On August 9th bilateral iridencleises were performed. The right eye did not do well and developed an absolute glaucoma and lost its vision. The left eye recovered after operation and remained in good condition during a follow-up period of several months.

CASE 4

E. M., a 60-year-old housewife, was admitted on January 3, 1956, for cholecystectomy. The surgery was performed January 5th. At 7:30 A.M. on that day premedication consisted of atropine (0.067 gr.), demerol (75 mg.), and seconal (3.0 gr.). Anesthesia was begun at 8:30 A.M. with sodium pentothal, succinylcholine, nitrous oxide, and oxygen. An endotracheal tube was used. The operation began at 8:45 A.M. and was completed at 9:40 A.M. The blood pressure was 130/90 mm. Hg. The patient left the recovery room in good condition.

At 6:30 P.M. the same day the patient noted blurring of vision and pain in the left eye. An ophthalmologist was called in consultation and found the tension was 30 mm. Hg (Schiøtz) in the right eye and 46 mm. Hg in the left eye. Questioning elicited similar but milder episodes of blurred vision about four months prior to admission. Miotic therapy (pilocarpine hydrochloride, two percent, and eserine, 0.25 percent) and acetazolamide (1,000 mg. in divided doses) were prescribed and the attack of glaucoma was relieved.

On January 6th, the ocular tension was 17 mm. Hg in each eye. Pilocarpine hydrochloride (two percent) was instilled in both eyes three times a day and acetzolamide (250 mg.) was given daily. Despite this therapy, on January 11th, the patient again developed a pain in the left eye and ocular tension was found to be 19 mm. Hg in the right eye and 46 mm. Hg in the left eye. The patient was discharged on January 17th with her abdominal wound well healed and with her eyes in good condition.

On subsequent admissions to the hospital, iridectomies of the left eye (January 25, 1956) and of the right eye (February 29, 1956) were performed. Both procedures were uneventful and recovery was good.

SUMMARY

Four cases are presented in which acute glaucoma occurred as a complication of general surgery. The responsible factors are considered to be atropine and scopolamine in premedication, deep anesthesia with pupillary dilatation, the excitement of hospitalization, the semidark room following surgery, and the predisposition of these patients to acute attacks by the anatomic structure of their eyes.

The symptoms of acute glaucoma are usually overlooked in the immediate postoperative period.

It is suggested that pilocarpine hydrochloride (two percent) be instilled routinely in the eyes of patients prior to general anesthesia and during the early postoperative period, in an endeavor to prevent acute attacks of glaucoma.

1749 Grand Concourse (53).
2625 Grand Concourse (58).

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SOLUTION DYCLONE*

A SELF-STERILIZING TOPICAL ANESTHETIC FOR OPHTHALMIC USE

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Occasional reports on the prevalence of ocular infections resulting from the use of contaminated ophthalmic solutions indicate that adequate preservation of such preparations still remains a problem to both manufacturer and clinician.[1-3] Since the majority of ophthalmic solutions are marketed in multiple-dose packages and can be prepared initially free of viable micro-organisms, the main difficulty apparently lies in the maintenance of sterility once a container has been put into use.

Considerable work has been done in an attempt to find the most suitable preservative for ophthalmic solutions.[4-7] Of the many agents tested, perhaps the three most widely used are phenylmercuric nitrate, benzalkonium chloride (Zephiran), and chlorobutanol. However, since each of these is attended by certain disadvantages,[8] search for the ideal preservative continues.

Recently, a new topical anesthetic was introduced for use in ophthalmology. The drug, dyclonine hydrochloride (4-n-butoxy-beta-piperidinopropiophenone hydrochloride), is a white, crystalline powder, stable in acidic aqueous solution, the anesthetic properties of which are characterized by rapid onset of effect, lack of systemic toxicity, and a low index of sensitization.[9-12] In addition, the compound has been found to possess significant bactericidal and fungicidal activity.[13] This activity has been reflected in the ability of a solution of dyclonine hydrochloride† to exert marked self-sterilizing properties, studies on which are presented in this report.

Experimental

Self-sterilizing properties of Solution Dyclone. In previous studies,[13] the germicidal action of an isotonic aqueous solution of dyclonine hydrochloride alone (0.5 percent) was determined following artificial contamination of aliquots with Staphylococcus aureus, Escherichia coli, Proteus vulgaris, Pseudomonas aeruginosa, Bacillus subtilis (vegetative cells), and Candida albicans, respectively. Subcultures at various intervals of time showed the majority of solu-

* From the Research Department, Pitman-Moore Company, Division of Allied Laboratories, Inc.

† Solution Dyclone—Trade Mark of Pitman-Moore Company.

tions to be sterile within 10 minutes after inoculation.

In the formulation of both solutions and ointments containing dyclonine hydrochloride, it was observed that among a number of agents tested as stabilizers for the anesthetic chlorobutanol afforded the best protection. It was further revealed by several different laboratory techniques that the incorporation of chlorobutanol in preparations of dyclonine hydrochloride resulted in a drug combination capable of acting synergistically against a number of micro-organisms frequently encountered in skin and mucous membrane infections.

Based on the results obtained with dyclonine hydrochloride alone and subsequent observations of an increased germicidal action in combination with chlorobutanol, additional studies were performed on the self-sterilizing properties of the finished product (Solution Dyclone). This was in the form of 1-fluid ounce quantities containing dyclonine hydrochloride (0.5 percent) and chlorobutanol (0.3 percent) in isotonic aqueous solution adjusted to pH 4.0. To individual bottles of the solution were added 0.1 cc. of appropriate dilutions of 18-hour broth cultures of Proteus vulgaris, Pseudomonas aeruginosa, and Candida albicans, and a saline suspension of Bacillus subtilis spores. As a control, sterile distilled water at pH 4.0 was similarly inoculated. All inoculated solutions were allowed to stand at room temperature and 0.2-cc. amounts subcultured into 20 cc. of suitable broth media at various intervals of time. Subcultures were incubated at 37°C. and final readings made after eight days. As shown in Table 1, bottles of Solution Dyclone inoculated with Proteus vulgaris, Pseudomonas aeruginosa, and Candida albicans proved sterile within two minutes after inoculation. Although vegetative cells of Bacillus subtilis had previously been shown to be susceptible to dyclonine hydrochloride,[13] spores were still capable of germination after four days' exposure to Solution Dyclone.

Comparative antimicrobial activity of Solution Dyclone. It is apparent from a review of the literature that very little attention has been given to the study of antimicrobial properties of drugs intended primarily for use as local or topical anesthetics. Procaine was reported to be active against staphylococci, streptococci, and Escherichia coli,[14] but inactive against Salmonella typhosa and enteritidis.[15, 16] Bacteriostatic action against staphylococci and Escherichia coli has also been demonstrated for 2-chloroprocaine.[17] Cocaine has been found active to a slight degree against species of Escherichia and Aerobacter.[18] Recently, tetracaine hydrochloride was shown to possess definite activity against Pseudomonas aeruginosa[19] and possibly against Staphylococcus aureus and Escherichia coli.[20, 21]

The antimicrobial activity of Solution Dyclone was compared with that of several known topical anesthetic solutions, that is, tetracaine hydrochloride, pramoxine hydrochloride, and cocaine hydrochloride. Effectiveness of the various preparations was determined by means of the F.D.A. agar cup-

TABLE 1

SELF-STERILIZING ACTION OF ISOTONIC AQUEOUS SOLUTION CONTAINING DYCLONINE HYDROCHLORIDE (0.5 PERCENT) AND CHLOROBUTANOL (0.3 PERCENT) (SOLUTION DYCLONE)

Organism	No. Cells Inoculated per cc. Solution	Time at Which Subculture Indicated Sterilization	
		Solution Dyclone	Distilled H_2O
Proteus vulgaris	38,000	2 min.	24 hr.
Pseudomonas aeruginosa	44,000	2 min.	>24 hr.
Candida albicans	24,000	2 min.	> 4 da.
Bacillus subtilis (spores)	42,000	>4 da.	> 4 da.

TABLE 2

COMPARATIVE ANTIMICROBIAL ACTIVITY OF VARIOUS TOPICAL ANESTHETIC SOLUTIONS

Solution*	Average Zone of Inhibition in Mm. (Radius Segment)		
	Staphylococcus aureus	Streptococcus pyogenes	Pseudomonas aeruginosa
Dyclonine HCl (0.5%)+chlorobutanol (0.3%)	7.0	7.0	0.5
Tetracaine HCl (0.5%)+chlorobutanol (0.4%)	4.8	5.5	1.0
Pramoxine HCl (0.5%)+benzyl alcohol (0.45%)	2.5	3.5	0
Cocaine HCl (0.5%)+chlorobutanol (0.3%)	0	0	0
Cocaine HCl (0.5%)	0	0	0
Chlorobutanol (0.3%)	0	0	0
Benzyl alcohol (0.45%)	0	0	0
Plain isotonic (pH 4.0)	0	0	0

* Solutions containing dyclonine and tetracaine were tested at concentrations as marketed; pramoxine solution was tested at one-half the strength supplied. Isotonic solutions of cocaine, chlorobutanol, benzyl alcohol, and sodium chloride at pH 4.0, respectively, were prepared in the laboratory.

plate method,[22] with Staphylococcus aureus, Streptococcus pyogenes (C 203), and Pseudomonas aeruginosa as test organisms. As indicated by the zones of inhibition recorded in Table 2, Solution Dyclone showed greater activity against the staphylococcus and streptococcus than did either the tetracaine or pramoxine solution. Cocaine alone and in combination with chlorobutanol was ineffective against these two organisms. Under conditions of the test, only Solution Dyclone and tetracaine were effective against Pseudomonas aeruginosa, the preparations being essentially equal in action.

Sterility of Solution Dyclone during clinical use. As mentioned previously, the main problem in dealing with an ophthalmic solution is the maintenance of sterility once in use. Not infrequently microbial contamination of various solutions has been observed within a short period despite the presence of preservatives and prior sterilization.

In a clinical trial of Solution Dyclone, a sterile preparation dispensed in one-half-ounce plastic bottles with extended dropper tips and styrene caps was routinely used in an ophthalmology outpatient clinic.* No special precautions were taken to maintain sterility. When only a few cc. remained in each bottle tests were made for the presence of viable micro-organisms. A series of 17 bottles was examined. Observing the usual aseptic precautions for the opening of containers preceding sterility testing, aliquots of solution from each bottle were subcultured into tubes of fluid thioglycollate medium, brain heart infusion broth with five-percent rabbit blood, and Sabouraud maltose broth. Duplicate tubes received an inoculum of 0.25 cc. each, distribution of the inoculum being made into a broth volume of 35 cc. in order to dilute out any bacteriostatic effect of the preparation in the subculture. The thioglycollate and blood broths were incubated at 37°C. for at least eight days, and the Sabouraud tubes were held at room temperature for two weeks.

No evidence of growth was apparent in any of the tubes inoculated. Sterility of the blood broth tubes was further confirmed by subcultures to fresh medium and by Gram-stain. Upon completion of incubation and as a check on the growth-promoting ability of the media employed, one tube of thioglycollate broth for each sample was inoculated with a stock culture of Staphylococcus aureus and the second tube with Escherichia coli. Sabouraud tubes were likewise inoculated with Candida albicans and Trichophyton mentagrophytes. On incubation all tubes

* The clinical trials were conducted at the Department of Ophthalmology, University of Oregon Medical School, by Dr. John E. Harris.

supported good growth of the respective organisms.

With controlled methods of test, a representative number of containers of Solution Dyclone have thus been found to be free of viable micro-organisms following use. These results indicate that the inherent antimicrobial properties of the preparation may be relied upon to maintain sterility under conditions of clinic and office practice.

Comment

While there are now definite requirements concerning sterility of commercially prepared ophthalmic solutions,[2,3] some divergence of opinion persists as to the best means by which this condition may be attained and subsequently maintained throughout product use. To insure safety, the ideal procedure is to prepare solutions that are self-sterilizing. Attempts to achieve this, although not always successful, have been through the incorporation of an antimicrobial agent. Because of the rigid criteria that have been set down for the perfect preservative,[6] some doubt exists that any one agent will ever be found to fulfill all of them. Not only should the ideal preservative be effective against all types of micro-organisms causing drug contamination, but it must be non-toxic in the concentration used and compatible with the preparation per se. In this respect, it is noteworthy that dyclonine hydrochloride besides being an effective topical anesthetic is apparently capable of acting as its own preservative against the usual contaminants encountered in ophthalmic solutions. The resulting enhancement of germicidal action of dyclonine hydrochloride in the presence of chlorobutanol affords increased advantage not only from the standpoint of formulation but for possible prevention and control of infection as well.

Summary

1. The self-sterilizing properties of Solution Dyclone, a new topical anesthetic solution for ophthalmic use, have been described.

2. The drug, dyclonine hydrochloride, in addition to its anesthetic action, possesses significant antimicrobial properties, the antiseptic effectiveness of which is considerably enhanced in the presence of chlorobutanol, incorporated in the solution as a stabilizer.

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THE RETINA: ITS ROLE IN THE SPEED OF PERCEPTION*

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Modern warfare and high speed flight as well as the increased speed of motor vehicles have emphasized the need for detailed knowledge concerning visual reaction time, perception of motion, target sighting, speed of vision at night, and speed of vision at high altitudes. Therefore, these subjects will be discussed after reviewing briefly a few pertinent points concerning the physiology of the retina.

The chemical and physical properties of retinal molecules are critical to the understanding of many of the basic phenomena of vision. Important among these molecules are the light-sensitive pigments, namely rhodopsin in the rods and iodopsin in the cones.[1] The action of light upon these pigments gives rise to an impulse which travels from the retina via the optic nerve to the brain, mediating visual sensations.

The retina reacts to light as a function of the distribution of the cones and rods. In an investigation by Lamar, Hecht, Shlaer and Hendley[2] parafoveal and peripheral contrast thresholds were about three times and eight to 15 times the corresponding foveal thresholds, respectively. The fovea centralis, containing only cones, is responsible for maximum central visual acuity by daylight or bright moonlight. In the macula lutea surrounding the fovea the cones still outnumber the rods. Vision is less acute but this region is more sensitive to motion than is the fovea.

* From the Department of Ophthalmology, New York University Post-Graduate School. This study was aided by a grant from The Ophthalmological Foundation, Inc., and from the Department of Research of the New York Association for the Blind. Reprinted with additions and with permission from *Modern Problems in Ophthalmology: Volume I*, Basle, Switzerland, S. Karger, 1956, pp. 239-250.

Peripheral vision is used to detect objects entering the field of vision and functions in very low illumination. Peripheral vision requires only 1/1,000 as much illumination as central vision.[3] Thus, moving objects may be detected by peripheral vision in a dim light but disappear when attempts are made to fix them directly.

The role of the retina in the speed of perception has been the subject of extensive research during the last few years.

Visual reaction time

Total visual reaction time is a function of numerous components including accommodation, convergence, visual acuity, eye movements, and sensory, perceptual, and motor responses. Strughold[4] has estimated that the time consumption of the various processes which lie between indistinct and distinct simple visual perception, including conjugate and disjunctive eye movements, accommodation, and pupillary reaction, varies between 200 and more than 1,000 milliseconds. The perceptual latent period of the eye, which is the time elapsing between stimulation and the beginning of perception, ranges between about 35 and 150 milliseconds.[5] The latent period of perception may be prolonged by light adaptation. According to Mita, Hironaka, and Koike,[6] under conditions of dark adaptation the value of the time elapsing between a stimulus and the sensation at a high intensity of the stimulus showed two minima at the fovea and at about 30 degrees in the periphery; and two maxima at about 10 degrees in the parafoveal area and at the extreme periphery; while the value with a stimulus of low intensity showed only a minimum at about 30 degrees from the fovea. Furthermore, the shortest times determined by the cone function and by rod function were obtained at the fovea and at about 30 degrees in the periphery, respectively, the former being shorter than the latter.

Under conditions of light and dark adaptation, the ability of the human eye to discriminate between two lights flashed at different times was investigated by Sweet,[7] who reported that latency of reactions was greater in the periphery than at the fovea but that perception of movements was more precise in the periphery than at the fovea.

The fact that the peripheral retina is capable of responding to stimuli which are spaced closer together in terms of time is one reason why motion is better detected in the periphery than in other areas.[8] In this respect flicker fusion frequency is related to the perception of movement in the periphery. Brooke[9] studied variations in critical fusion frequency with brightness for various positions in the test field. He found that for foveal observation the curve of log critical frequency against log brightness showed no inflection as it rose to a maximum. For peripheral observations, however, the curves rise to a plateau at low brightness, dip at medium to low brightness, and again rise to a maximum, thus conforming to the conventional "cone" curve at high brightness. The maximum becomes lower and lower for locations increasingly distant from the fovea.

Factors other than visual are involved in reaction time. One of the most important of these is the individual's "set" or readiness for the signal and preparation to respond. Thus, Luckiesh and Moss[10] found that a driver is able to see an unexpected obstacle only about half as far away as he can see an expected one, a finding that highlights the need for *anticipatory* driving. When an F-86 pilot attempts to cover the sky at all points of the clock and at all levels, and at varying ranges, the elements of speed, altitude, and eye range often combine to present a firing MIG-15 at 5-o'clock when the pilot has just finished clearing himself in that direction.[11]

Distinction must also be made between simple reaction time and complex or choice reaction time; the latter is particularly significant in real situations. In this connection, Hick[12] has noted that the greater the

number of alternatives from which the response has to be chosen, the longer the reaction time: ". . . If *n* is the number of equiprobably different stimuli or signals, any one of which may occur, and the reaction is to make the appropriate simple movement, such as pushing a button, the average RT is approximately 0.27 log (n + 1)."

The reaction time of a pilot to an approaching object is modified by the location and amount of the retinal stimulus, eye movements, accommodation, convergence, pupillary reaction, and fatigue. In an aircraft the pilot must constantly shift attention between instruments, the ground, and other aircraft or targets. Head movements and head rotations, which are necessary for efficient air search, also affect reaction time. Emerson[13] suggested that monocular blind areas in visibility from aircraft are, in effect, areas that are blind to both eyes. These blind areas may be due to opaque structures, monocular retinal blind areas or suppression of a "nonprojecting" eye.[13]

Furthermore, visibility is an important factor because Shepperd[14] estimated that an aircraft which can be seen a mile away with unobstructed vision can be seen only 0.9 mile away through a piece of clean glass at a 70-degree angle of incidence, only 0.7 mile away through a piece of clear plastic, and only 0.5 mile away through a piece of scratched plastic at the same angle. Such differences in visibility tend to increase the length of time from presentation of an object to the reaction of the individual. This is due to inability to detect the presence of the object and not due to an increase in reaction time per se.[8]

Perception of movement

According to Gibson[15] the stimulus condition for a moving object is the moving sheaf of light rays reflected from it. He pointed out that the retinal image moves relative to the retina and to the background of the environment; for a fixated eye the stimulus for visual movements is retinal movement; normally the eye follows a moving object with a rotary pursuit movement, with the image of the object focused primarily on the fovea; in this situation the background image moves across the retina but the object image does not.

The experiments of Kilpatrick and Ittelson[16] showed that a given movement across the retina, for example, movement in a constant direction at a constant speed, could be produced by a variety of external objective movements, and could be complicated by eye and head movements as well as spatial orientation. Thus, it is understandable that individuals differ in their ability to report movement accurately. Results obtained by Kephart and Besnard[17] indicate that the discrimination of moving objects is a much easier task when the objects are viewed from the side than when viewed from the end or when approaching the subject. Moreover, movement in the horizontal plane is more frequently correctly reported than movement in the vertical plane.[18] Miller and Ludvigh[19] have demonstrated that when a test object moves in a vertical plane, visual acuity may deteriorate. Byrnes[8] suggests that this is a problem of visual alignment rather than one of visual acuity because visual perception is impaired, but this is due most probably to the decreased ability of the eye to follow objects accurately in a vertical direction. It has been reported that the threshold of visible movement decreases (becomes more acute) as exposure time is increased, and that this decrease becomes less as the exposure time becomes longer.[20]

The perception of movement occurs within a wide range of speeds which makes it possible to perceive a moving object in extreme peripheral vision when the smallness of the object makes it invisible if stationary in the peripheral field.[21] In a study on the effect of reference lines on the discrimination of movement, Leibowitz's findings[22] support the hypothesis that movement is discrimi-

nated at slow speeds by observation of change of position.

The retinal image is also affected by locomotion. The visual field during forward locomotion seems to expand radially from a point of focus on the line of locomotion.[15] According to Gibson[15] the resulting changes in the retinal image can be specified in terms of differential angular velocities. This retinal motion increases when speed of travel is increased.

When there are no fixed reference points in the visual field, the motion perception threshold varies. According to Rose,[23] if the visual field lacks fixed reference points, for example, if a light point is observed in undifferentiated space, as in a completely dark room, the motion perception threshold is 15 to 30 angular minutes per time second and the minimum required displacement is 1°20′. However, he found that if there are fixed reference points in the visual field, the perception threshold is one to two angular minutes per second and the minimum displacement required is 20 angular minutes.

When flying above the clouds at 40,000 feet, space myopia due to looking into an empty visual field (that is, a clear blue sky which is frequently present in the hemisphere above the horizon) occurs.[24] According to Whiteside,[25] on the basis of certain experiments, it is to be expected that a pilot searching for a target aircraft in a cloudless sky would detect it at about half the distance at which he could detect it with the assistance of a stimulus at infinity, such as a background of clouds or condensation trails. When increasing numbers of high speed aircraft operate at such high altitudes as 40,000 feet, space myopia may contribute to the cause of collisions. Everest[26] has noted that if, while flying in formation, he became separated from the group at approximately 40 or 50 thousand feet he would have difficulty in regaining contact. This he attributed to the possibility that airplanes at this high altitude appear smaller and are more difficult to pick up by visual means.

Whiteside[25] found that when a stimulus at the far point is suddenly removed, accommodation increases involuntarily until it reaches the resting level of about 0.5 to 1.0 diopter. The resting level of accommodation fluctuates between 0.5 and 2.0 diopters, but, in general, the results show that after losing sight of both a near and a distant stimulus accommodation takes about 60 seconds to reach its resting value. In studying accommodation levels in empty visual fields, Westheimer[27] pointed out that the amount of accommodation is not constant but varies from moment to moment until a fixation object is introduced into the previously empty field.

The difficulty of seeing at high altitudes is not lessened by the fact that the light distribution is reversed at high altitudes because the bright sky, formed by cloud and haze, is below and the darker blue sky is above.

Target sighting

Accuracy in detecting a moving target depends not only upon the efficiency of the eye but also upon the design of equipment. In target sighting it is important to detect an object and to recognize its form. Ludvigh's experiment[28] revealed that the maximum surface for visibility was at the point of nearest approach of a disc and as the linear velocity of an object increased, the point of maximum visibility receded farther and farther from the point of nearest approach. Brown[29] conducted a study in which observers were required to report the direction of a traveling spot. The spot was presented at 10 different speeds. He found that in general as the speed of the target increases the frequency of discriminating its direction also increases.

An experiment[30] dealing with the monocular luminance threshold of a moving target as a function of the target speed and direction of movement showed that threshold

luminance increased linearly with increases in target speed. Lower luminance thresholds were obtained for vertical target movements than for horizontal movements.

Low levels of illumination and the adaptation of the eye to instruments are factors in target sighting. The greater photopic sensitivity of the fovea and the macula lutea are important considerations in the detection of signals by radar operators, for the radar display varies in brightness, density pattern, and size of spot. The visibility of traces on a radar scope may steadily deteriorate with eccentricity of view. In Williams' experiments[31] the signal strength required for threshold steadily increased as the pip's location was moved peripherally from the binocular line of sight. Both scope brightness and pip sizes were variables in this peripheral impairment of visibility. Bowen and his co-workers[32] suggested that as scan speed decreases, signal detection improves.

The times required for the detection of a target on a simulated PPI scope were determined by Brown, Diamond, and Adler[33] for various scope luminances after different durations of light adaptation to a luminance of 3,100 millilamberts. Increased duration of light adaptation resulted in increased detection time up to a maximum value which varied with scope luminance. This value decreased with either an increase in target luminance or a decrease of background luminance. Changes in target luminance result in a greater change in detection time than comparable changes in background. Therefore, for radar scope viewing, optimum visibility may be obtained with maximum gain and a "negative bias" voltage that will provide the darkest possible background without appreciable loss in target luminance.[33] This is another example of the fact that in the detection of any object increased contrast will improve detection ability.[8]

Sighting targets by means of periscopes also presents problems. Sperling and Farnsworth[34] noted that any prolonged fixation on illuminated indicators before or during periscope observation would probably hinder sharp vision and require a prohibitively long dark-adaptation time.

Speed of vision at night

Dark adaptation is important in detecting motion at night; it has been found that dark-adapted eyes can recognize motion at night at a speed three to four times as great as that necessary to create the sensation of motion in light-adapted eyes under the same conditions.[35]

For night-seeing, so-called off-center vision, that is, looking past an object is most efficient. An aircraft in flight can be seen at night from another aircraft at a distance of approximately 1,000 feet but only if it is viewed from above, below or from the side.[36]

Several phenomena may impair night vision efficiency. In dim light the eye almost always becomes slightly near-sighted. This is due to peripheral aberration of the lens system introduced by the larger pupil at night[37] and to the involuntary accommodation of the same type as found in space myopia.[38] Furthermore in night vision fading of visual sensations may occur after prolonged stimulation. According to Cibis,[39] this may cause pilots to lose the ability to see the horizon at night. This type of retinal adaptation has been counteracted by turning over into inverted flight, which merely changes the pattern of retinal stimulation.[39] Scanning, that is, moving the eyes, rather than steady fixation reduces the possibility of retinal adaptation.

Cibis[39] has pointed out that retinal adaptation to exposures of intermittent light varies inversely with the intensity of the single impulse and with the impulse frequency, although the total light energy applied over a given period may be constant. He concluded that retinal adaptation to intermittent light of given intensity at a given state of adaptation is mainly determined by the dura-

tion of the dark interval between the single stimuli.

Light not only decreases night visual efficiency but also apparent movements of lights observed during night flying may be misinterpreted. An example is the autokinetic illusion in which a pilot staring at the tail light of a moving lead plane may perceive it to be moving from side to side whereas in reality it is going straight ahead.[38] Such illusions are particularly detrimental in formation flying and at increased speed.

Speed of vision in relation to high speed

Speed of vision is important to drivers of motor vehicles for at 60 miles an hour it requires only approximately 3.4 seconds to travel 300 feet.[40] The braking reaction time of a healthy individual is three quarters of a second. At 20 miles an hour a car can be stopped within 47 feet but at 60 miles an hour a car travels 66 feet before the brake pedal is even applied.[40, 41] An individual with 20/50 vision can read the word STOP on a stop sign 90 feet ahead but at 60 miles an hour, if he had ignored previous warning signs, he would be 276 feet beyond the stop sign before he could stop.[40, 42] Visual reaction time is not changed by high driving speeds but the consequences are altered and these become even more complicated in relation to the fast flying speeds of today.

An individual flying at 1,800 miles per hour is traveling about one half mile per second. According to Byrnes[43] at this speed the following would occur: An object appearing within the pilot's visual range is not detected for 0.1 second, during which time his aircraft moves 264 feet. The lag in perception is about 0.4 second, during which time he has traveled 1,042 feet. Recognition comes about 1.0 second later after he has traveled 3,682 feet. By the time he decides what to do he has traveled a total of 4,724 feet. Two aircraft approaching each other from a distance of 3,000 feet would collide before the pilots could act. With only 500 feet between the planes they would collide without having seen each other.

Even if a pilot has 20/15 vision he will be just able to distinguish a F-80 fuselage four miles away.[43] Byrnes[43] estimated that with both pilots flying at 1,800 miles per hour neither has more than four seconds between time of recognition and collision. If perceptual time and time to change the course are deducted, no time would remain for the manual use of armament. At velocities of Mach. No. 3.0 there is a nonperceptual interval of about 100 meters which is in reality a distance scotoma.[5]

Speed of accommodation is an important factor in flying at a speed of 1,800 miles per hour. To read a dial and look back to clear vision requires 1.5 seconds to 2.39 seconds, according to the age of the pilot; 3,960 to 6,336 feet would be covered in that interval.[43]

Gerathewohl and Strughold[44] have stated that if a pilot in a conventional high-speed plane, traveling at about 250 knots, takes a reading on his speed, the time required for the saccadic eye movements may total about 280 milliseconds, during which the plane has traveled approximately 250 feet. They also calculated that in landing at about 105 knots, the entire maneuver, including perception and visual adjustment, corresponds to a distance of some 275 feet, and during this interval the pilot cannot watch the runway or his landing aids.

In another paper by Strughold[4] it was estimated that the latent period of simple optical perception, in connection with high speed, may last $\frac{1}{30}$ to $\frac{1}{10}$ of a second, depending upon the intensity and the wavelength of the light and upon the adaptation and region of the retina stimulated; under normal conditions of daily light the latent period of foveal perception is below rather than above $\frac{1}{20}$ of a second; under the same conditions the extrafoveal perceptual latent period is above rather than below $\frac{1}{20}$ of a second.

Latent time of perception and recognition,

reaction time during take-off and landing, and the so-called "dead distances" which are covered by the reaction time, time sense, and acceleration are among the physiologic navigation problems of space flight. Armstrong, Haber, and Strughold[45] have estimated that at a speed of one km. per second the nonperceptive interval may cover a physiologic "dead distance" of 200 meters. These authors believe that with other reactions, such as recognition reaction time, which may last one or two seconds, a "dead distance" of up to one km. and more must be considered. In addition the physically dead distance resulting from the lag of the controls of the space ships increases the total dead distance by many kilometers.[45]

According to Gerathewohl[46] psychophysiologic stimulation during space flight may affect visual perception. This investigator reported that when an individual, who is in a stable position with respect to the vertical, is subjected to accelerations different from one g., the perceived object seems to move opposite to the direction of the rotation of the resultant between centrifugal force and gravity; with increasing acceleration (gravity) in the vertical direction an object or objects within the field appear to move in an upward direction; at decreasing accelerations (in the subgravity and zero-gravity states) apparent motion and displacement of the objects downward occurs. Thus, Gerathewohl[46] has pointed out that the ability of the individual to control his environment visually may be impaired. To counteract such effects more efficiently designed equipment, based on human engineering principles, will be required.

Summary and Conclusions

The detection of moving objects is principally the function of peripheral vision. Stimulation of the periphery of the retina requires less light than the central area. But speed of vision, including visual reaction time, depends upon the co-ordination of accommodation, convergence, visual acuity, eye movements, pupillary reaction, and sensory, perceptual, and motor responses, as well as on enviromental factors affecting visibility and the general adaptation of the organism.

With high traveling speeds and the possibility of space flight, every second or part of a second required for visual detection of moving objects has become of great importance.

In detecting motion at night dark adaptation is important. Various visual phenomena can reduce speed of vision at night, for example, the fading of visual sensations after prolonged stimulation, night myopia, autokinetic movements, and illusions involving moving lights.

Consideration of high speed of automobiles in relation to speed of vision reveals that the reaction time required in applying a brake pedal can result in an accident. Moreover, low visual acuity hampers the reading of stop signs at high speeds and could be a factor in accident involvement.

Studies of the speed of vision in relation to high speed flight suggest that at a speed of 1,800 miles per hour the time required by the eye for recognition of an object would be a contributory cause of collisions. In space flight the situation is intensified by the time lag caused by the controls of the space craft. Increasing and decreasing accelerations produce illusions of apparent motion which disorient the individual in regard to his environment.

The importance of the retina in the speed of perception is evidenced by the fact that pilots are trained concerning the use of their eyes and instructed as to the proper procedures for eliminating illusions or various phenomena connected with moving targets and objects. It is essential to know that the periphery of the retina is capable of detecting a moving object in a dim light but that the same object may disappear if central vision is utilized. Scanning is often more advantageous than direct fixation.

In aviation, the high speeds already attained have surpassed the speed of vision. The retina must be aided in sighting by powerful radar, electronic computers, and like devices and equipment based on human engineering principles.

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PSEUDOSTRABISMUS WITH HETEROTOPIA OF THE MACULA*

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Heterotopia of the macula, or physical displacement, accompanied by the appearance of eccentric fixation, while probably not rare has been infrequently reported in the literature. Within the past year three reports[1-3] have appeared, adding five cases to the 12 previously reported.[4-15] We will review the literature, adding eight cases, and discuss the etiologic factors, clinical features, and treatment of this condition.

REVIEW OF THE LITERATURE

The first report was by Derzhavin[4] in 1896. His patient had vision in the right eye of 5/200 and in the left eye, 20/80. Both eyes deviated to the right on binocular fixation. The left macula was displaced inward. Peripheral pigmentation and hyaloid remnants, with strands running out toward the peripheral fundus, were reported. Horizontal nystagmus was also noted.

Bernhard,[5] in 1898, reported the case of a 15-year-old boy, who, on binocular fixation, presented the appearance of a right hypotropia, although orthophoria was present.

* From the Wilmer Ophthalmological Institute of The Johns Hopkins University and Hospital. Presented in abbreviated form at The Wilmer Residents Association meeting April, 1957.

The patient had nystagmus, microcornea, and peripheral retinal pigmentation, as well as a choroidal coloboma. The left macula was displaced temporally and inferiorly, causing the apparent right hypertropia. Vision in this eye was reported as 20/40.

Adam,[6] in 1912, reported a case with temporal and superior displacement of one macula. This produced an appearance of divergence and sursumvergence, which on further examination were found not to be present. Hyaloid remnants were described between the optic disc and macula. Vision was reported as normal, and the patient was noted to be fixing with his macula.

Krueger,[7] in 1913, presented the case of a 19-year-old man with right-eye vision of 20/120 and left-eye vision of 20/80. There was displacement of both maculas, the right temporally and inferiorly and the left temporally and superiorly. He gave the appearance of having exotropia and left hypertropia, but had an actual esotropia. Retinal pigmentation was present in the peripheral fundi. Central fields revealed displacement of the blindspots corresponding to the macular displacements.

Triebenstein,[8, 9] in 1919, reviewed the existing literature, and presented two additional cases, in a mother and her son. The former had a right-eye vision of 20/50; her left-eye vision was recorded only as very poor. There was an upward and outward displacement of the left macula, and the patient appeared to have an exotropia. Actually an esotropia was present. The son had vision of finger counting at 10 feet in the right eye and 20/40 in the left. The macula in each eye was displaced temporally, the right one also being displaced upward and the left downward. An apparent exotropia was present, although the patient was orthophoric. Peripheral retinal pigmentation was noted in both patients.

Beselin,[10] five years later, reported the case of a man with apparent exotropia. The maculas in both eyes were displaced temporally and superiorly. In both eyes there was noted the presence of marked peripheral retinal pigmentation and scarring due to old chorioretinitis. Visual acuity in the right eye was 20/100 and in the left eye 20/100.

Bielschowsky,[11] in 1930, described a patient who had upward displacement of the right macula and downward displacement of the left. The fundi showed old chorioretinal scarring. The patient, whose vision was recorded as three-fourths normal, had an apparent esotropia and right hypertropia, while the actual findings were those of exotropia and left hypertropia.

Friedman,[12] in 1942, reported the first case in the English language. He described the findings in a young man who had apparently suffered trauma to the right eye during forceps delivery, with poor vision in that eye since childhood. Best corrected visions were right eye 20/400, left eye 20/15. The right eye showed a disciform lesion of the macula, the entire macular region being displaced downward and nasally. Central fields in this eye revealed a scotoma corresponding to the macular lesion, with the blindspot also being displaced downward and inward. There was an apparent right hyperphoria. When the patient fixed with his right eye, he brought it down and in, thus bringing the fixing area of the eye up and out. He fixed on the ophthalmoscope light with his macula.

In 1950, Cohen and Weisberg[13] reported still another case. Vision in this patient was 20/30 − 2, in the right eye, and 20/20 − 2 in the left eye. On fixation both eyes appeared to deviate, the right eye downward and externally. On screening, however, he was found to have 10 prism diopters of esotropia and 20 of right hypertropia. Both maculas were displaced temporally, with the right being displaced inferiorly as well, and the left superiorly. There was displacement of the blindspots corresponding to the macular displacement. The patient suppressed alternately.

Blaxter,[14] in 1951, presented the case of a 10-year-old girl whose birth had been three weeks premature. Shortly after birth the left

eye had been noted to be smaller than the right. An apparent left hypertropia had been noted since 18 months of age. Her vision was normal in the right eye and 20/40 in the left. There was an apparent left hypertropia in all fields of gaze; however, no movement was noted on cover test. She had normal binocular vision. In the left eye there was noted chorioretinal scarring from 10- to 12-o'clock positions in the periphery, with traction bands pulling the macula upward.

Trevor-Roper,[15] one year later, reported the case of a patient who had developed an inflammatory retinal detachment, and who also had active pulmonary tuberculosis. After the detachment had subsided the patient developed a vertical diplopia, with traction bands pulling the macula in the affected eye downward.

Horwich and Linfesty,[1] in 1956, presented still another case. This patient had peripheral fundus lesions in the lower periphery of the right eye with downward and inward displacement of the macula. He had previously had a recession of the right superior rectus for a right hypertropia of 21 prism diopters. When seen three years later he had normal vision, O.U., and in the primary position appeared to have a left hypertropia. He had, however, a right hypertropia of 12 to 20 prism diopters, and an exotropia which varied from zero to eight prism diopters. The patient had been born at term.[16]

In the same month as Horwich and Linfesty, Payne and Crick[2] reported three cases:

The first of these was a 12-year-old boy, who had been born seven weeks prematurely, with a birth weight of four and three-quarters pounds. Shortly after birth a marked apparent divergence of the right eye was noted. At the age of two years he was given −2.0D. sph., right eye, and −2.5D. sph., left eye. At the age of six years, the left eye was patched; the patient thereafter developed an esotropia. At the age of eight years he was noted to have an alternating esotropia, preferring the left eye. Four years later he had visual acuities, best correction of 20/40 right eye and 20/20 left eye. With the left eye covered, the right eye, despite the patient's esotropia, fixed in an apparently divergent position. The angle kappa was +20 degrees in the right eye and but +1.0 to +2.0 degrees in the left. The right fundus showed scarring in the temporal periphery with displacement of the macula temporally. The authors felt this to be a manifestation of abortive retrolental fibroplasia.

Their second case was that of a 20-month-old boy, one of premature twins, whose birth weight had been four and one-quarter pounds. The eyes appeared to diverge greatly. Both fundi showed evidence of incomplete retrolental fibroplasia, with the maculas being pulled temporally by retinal folds.

Their third case was that of an adult man who had been treated with diathermy to the lower temporal periphery of the right eye for retinal periphlebitis. Five years later he was noted to have folds pulling the macula downward. There was apparent marked right hypertropia, but no deviation was elicited on cover. The etiology was apparently not entirely traumatic, since downward displacement of the macula had been noted before diathermy was performed.

One month later Foulds[3] reported a patient with downward displacement of the macula following inflammation. The patient at the age of two years had developed an acute hypopyon iritis in the right eye, which many months afterward was seen to have left chorioretinal scarring in the lower periphery with traction bands running toward the macula. There was an apparent left hypertropia and an actual right hypertropia. The patient had original visual acuities of 20/200 in the right eye and 20/15 in the left. After patching of the left eye, the right-eye vision improved to 20/20 and remained at that level.

Ellis,[17] in a still unpublished paper, reported two additional cases:

The first was that of a four and one-half year old boy, who was born two weeks prematurely. His birth weight was normal and

no supplementary oxygen was given. An external squint of the left eye was noted at 18 months. He was given glasses and attempted patching to the left eye at two and one-half years of age but would not co-operate. When seen by Ellis, right-eye vision was 20/300, left-eye vision 15/20. There was apparent eccentric fixation in the left eye and an apparent exotropia. Actually, inward deviation was present. The patient suppressed the right eye. Fundus examination of the right eye revealed bands in the retina radiating temporally from the disc, involving the macular area. A large area of depigmentation was noted in the inferior temporal quadrant at the equator. In the left eye, a few fine folds were noted radiating temporally from the disc, and the macula appeared to be displaced temporally.

The second case was that of the first patient's three-year-old sister who had been noted to have a right esotropia at 12 months of age. She was born about four-weeks premature, with a birth weight of five pounds, two ounces, but had received no supplementary oxygen. Vision was 6/200 in the right eye and 20/100 in the left. There appeared to be eccentric fixation in both eyes. An esotropia and right hypertropia were present. In the right eye, dense retinal lines were seen radiating temporally from the disc, and the macula appeared to be displaced nasally and inferiorly. A few similar folds were seen in the left eye, but the macula appeared to be in normal position.

Ellis points out that retrolental fibroplasia may have caused the fundus lesions in both these cases but states that the first case may also represent intrauterine chorioretinitis.

Other cases cited in previous reviews are those of Pfluger,[18] Lange,[19] and Doesschate[20] mentioned by Triebenstein, and those of Brewerton[21] and Kraupa,[22] by Duke-Elder. We feel that the data in these case reports are insufficient to warrant inclusion in this review.

Displacement of the macula as a sequela of trauma, either direct or secondary to such operations as diathermy, we consider to be outside the scope of the discussion here. We feel this because of its frequent occurrence and because the eyes affected are usually useless. The cases reported by von Szily,[24] Fuchs,[25] and Stein[26] fall into this group.

Reports of cases

Case 1

Case 1 was that of a six-year-old white boy, born two months prematurely, with a birth weight of three pounds. He remained in the hospital for two and one-half months during which time he received supplemental oxygen therapy. At the age of three years his parents noted the left eye turning out and up. He had worn glasses and a patch to the left eye for a brief time without beneficial result.

When seen at the age of six years, his cycloplegic retinoscopy was: R.E., -1.5D. sph. $\bigcirc$ $+2.5$D. cyl. ax. 120°; L.E., $+0.75$D. sph. $\bigcirc$ $+0.25$D. cyl. ax. 90°. He appeared to be fixing constantly with the right eye and to have eccentric fixation in the left. There was a double elevator palsy in the right eye. There was peripheral scarring of the left temporal retina, with the upper temporal vessels pulled outward as they left the disc, and temporal displacement of the macula was noted. His corrected vision was 20/30 in the right eye and 20/100 + 1 in the left eye. He had an apparent exotropia; on prism cover test, however he disclosed an esotropia of 25 prism diopters and a left hyperphoria of 30 prism diopters with the right eye fixing, and an esotropia of 40 prism diopters and left hyperphoria of nine prism diopters with the left eye fixing. He suppressed the left eye.

Case 2

Case 2 was that of a four-year-old white girl who weighed two pounds, 11 ounces at birth. This child was given supplemental oxygen for three and one-half months after birth. An apparent external deviation of the eyes was noted from early infancy.

She was first seen at the age of four years. Cycloplegic retinoscopy revealed a refractive error of approximately -2.5D. in both eyes. Visual acuity, which was not reliable, was recorded as 20/70 in both eyes. Fundus examination revealed scarring in the temporal periphery as well as folds in both retinas running from above the disc to the temporal periphery. Both maculas were displaced temporally. Although the patient gave the appearance of marked divergence in the primary position, she had an actual esotropia of 14 to 19 prism diopters and a left hypertropia of 10 prism diopters when tested both by screening and with the amblyoscope. Her extraocular movements were full and she had excellent convergence.

Case 3

Case 3 was that of a six-year-old Negro girl who was born prematurely with a birth weight of three pounds 13 ounces and received prolonged

oxygen administration. Visual acuity in the right eye with −2.5D. sph. was 20/70; visual acuity in the left eye with −5.5D. sph. ⊂ +1.0D. cyl. ax. 75° was 20/30. Although there was an apparent divergence this could not be fully substantiated by the prism cover test because of a marked nystagmus. There was apparent eccentric fixation in the right eye, although the child fixed on the ophthalmoscope light with the macula. Fundus examination revealed marked peripheral changes temporally, and the macula was displaced about four disc diameters temporal to the disc. The left eye was normal.

Case 4

Case 4 was that of an 11-year-old prematurely born white girl first seen in April, 1948, with an esotropia of 25 prism diopters and apparent paresis of the left lateral rectus and left superior oblique muscles. Visual acuities, best corrected, were 20/50 in the right eye and 20/200 in the left eye. There was compound myopic astigmatism in both eyes, the right eye having about six diopters more myopia. A large retinal fold was noted in the left eye running from the superior periphery to the disc, causing distortion of the disc and upward displacement of the macula. She received intermittent patching to the right eye for one year with no improvement in vision.

For the next few years, she remained approximately the same, except for some increase in myopia, both eyes. In 1954, she underwent surgery, the left medial rectus being recessed five mm., and the left lateral rectus being resected eight mm. On discharge, an exotropia, which persisted for the next several months, was noted. Accordingly, a four-mm. left medial rectus resection and a seven-mm. left lateral rectus recession was then performed. When last seen she had 50 prism diopters of esotropia and 60 prism diopters of right hypertropia.

Case 5

Case 5 was that of a prematurely born white girl, who presented at the age of five an apparent marked exophoria and left hyperphoria. With moderate myopic correction, vision right eye was 20/200 and vision left eye was 20/30. On ophthalmoscopic examination, the temporal vessels in either eye were seen to emerge from the temporal side of the disc. The maculas of both eyes were pulled temporally; the left macula appeared also to be pulled down slightly. There appeared to be marked divergence of the left eye; however, on screening a large degree of esotropia was noted. The child appeared to fix with the macula in either eye.

Case 6

Case 6 was that of a six-year-old boy who was seen for the first time at the age of five years because of an apparent divergent left eye which was noted two years before. Occlusion had been previously attempted without improvement in vision. Vision was 20/20 right eye and 20/50 left eye. Retinoscopy was: R.E. +0.5D. sph. ⊂ +1.0 D.cyl. ax. 90°; L.E., +1.5D. sph. ⊂ +0.5D. cyl. ax. 90°. There appeared to be eccentric fixation in the left eye.

After two weeks' occlusion of the right eye, corrected vision was 20/20 in each eye. A marked apparent exotropia was present but an esophoria of small degree was noted on cover test. Fusion was normal with Worth lights and red filter tests. Visual field studies received fair co-operation and showed temporal displacement of the macula in the left eye. The right blindspot was recorded normal in position. The temporal periphery of the left fundus showed changes compatible with mild retrolental fibroplasia and the left macula was pulled temporally.

Case 7

Case 7 was that of a seven-year-old white boy, supposedly of full-term birth, whose birth weight was five pounds, eight ounces. When seen at the age of five years, he had vision in the right eye of 20/100 and vision in the left eye 20/20, uncorrected. He had moderate hyperopia and glasses did not improve his vision. There appeared to be eccentric fixation with the right eye, and with both eyes fixing the eyes appeared to turn out. An exotropia of eight prism diopters was noted for distance, and 18 prism diopters for near. Crossed diplopia was elicited. The fundus examination of the right eye revealed temporal pulling of the retinal vessels and maculas, with a glial reaction temporal to the disc. The child fixed on the ophthalmoscope light with the macula. The left eye was found to be normal. After occlusion of the left eye, the right eye vision was improved to 20/50 and remained at that level.

Case 8

Case 8 was that of a four-year-old Negro girl, born about four months prematurely, with a birth weight of about two pounds. Cycloplegic retinoscopy revealed a refractive error of −3.0D. sph. ⊂ +1.25D. cyl. ax. 120° in the right eye, −13.5D. sph. ⊂ +3.0D. cyl. ax. 60° in the left eye. Visual acuities were not obtainable. The left eye appeared to fix eccentrically outward, and, on binocular fixation, the eyes appeared to deviate outward. On cover-uncover, an esotropia of about 30 prism diopters was noted. Fundus examination of the left eye revealed peripheral changes superiorly and temporally, with a large traction band running from this area to the macula, and drawing the macula outward and upward.

Discussion

Several of the authors already mentioned discussed the causes of heterotopia of the macula. Triebenstein[8] felt that vascular anomalies, caused either by congenital anomalies or by intrauterine inflammation, were

responsible. Cohen and Weisberg[13] ascribed the findings in their case to abnormal deficiencies in the rates of growth and maturation of the involved portion of the retina. In this connection, it was pointed out by Mann[27] that in the newborn there is normally a movement of the macula away from the disc and that this movement may be subject to either limitation or exaggeration because of environmental factors.

Horwich and Linfesty[1] quoted the embryologist Aeleta Barber who felt that such changes might be on a congenital basis (for example, abnormal growth rates of the parts concerned) or on a mechanical basis (for example, adhesion of the vessels in the primary vitreous to the retina, or by proliferation of retinal strands following a fetal retinitis). Payne and Crick[2] also referred to the embryologic factors discussed by Mann, and also pointed to abortive retrolental fibroplasia as the probable cause in two of their three cases. Ellis[17] pointed out that all the above causes are possible in his two cases.

Certainly no one single cause exists for heterotopia of the macula. Trauma, either accidental (von Szily,[24] Fuchs[25]) or operative (Stein[26]), with resultant scarring of the retina and with retinal bands pulling the macula out of position, is an obvious etiology, which as mentioned before we have felt to be outside the scope of this discussion. Chorioretinitis, either intrauterine or postnatal, is well documented as another possible cause (table 1). The presence of other congenital anomalies, such as microcornea or coloboma, would indicate that a developmental basis may sometimes be responsible.

We should like to point out, however, that all eight cases presented by us appear to have as the etiology an abortive form of retrolental fibroplasia. So do two of Payne and Crick's three cases, and possibly Blaxter's as well. Thus, of those patients who have been presented since 1950, the overwhelming number were prematurely born and had fundus lesions compatible with the diagnosis of abortive or incomplete retrolental fibroplasia. Although no method of proof is possible, the fact that retrolental fibroplasia can occur in infants who were not prematurely born and who did not receive supplementary oxygen[28, 29] might suggest that some of the earlier reported cases may have had this condition in a mild form. Patz[30] points out that the temporal periphery of the fundus is the most frequent site for the development of the disease, since this area is felt to be least vascularized at birth. The development of retrolental fibroplasia in the temporal periphery might account for early reported outward displacement of the macula and peripheral pigmentation.

Although retrolental fibroplasia is now a waning disease, those premature infants who were born at the time the disease was at its height are now at an age where children present themselves with eye muscle problems. This may account for the recent increase in the number of the reported cases. As was suggested by Horwich and Linfesty, heterotopia of the macula is by no means as rare as would seem to have been indicated previously. This being the case, it would follow that greater attention should be paid to the possibility of the condition's presence during the routine examinations for muscle balance.

Most cases of heterotopia of the macula, at least where it is present in a degree sufficient to manifest itself in clinical findings, will have certain characteristic features. On fixation with both eyes, the eye with the ectopic macula will tend to deviate in the same direction as the macular displacement. Thus, if the macula is displaced temporally, the eye will tend to deviate out. In this manner, the macula of the apparently deviating eye is brought into line with the other.

Central fields if reliable will show displacement of the blindspot corresponding to the altered anatomic relationship between the disc and the macula. Because of the age of our patients, we were able to demonstrate this blindspot displacement only in Case 6.

Although a marked apparent deviation is often noted, cover-uncover testing will often

TABLE 1

SUMMARY OF CASES OF HETEROTOPIA OF THE MACULA

Author	Associated Findings	Position of Macula R.E.	L.E.	Strabismus Apparent	Actual	Probable Etiology
Derzhavin	Peripheral pigmentation Retinal strands, hyaloid remnants Nystagmus R.E., 5/200; L.E., 20/80	Normal	Inward	Eyes deviated to right		Chorioretinitis (? retrolental fibroplasia)
Bernhard	Peripheral pigmentation Microcornea Coloboma of choroid	Normal	Outward Downward	RH	None	Congenital
Adam	Hyaloid remnants Normal vision	One macula displaced upward and outward		XT Sursumvergence	None	Congenital
Krueger	Peripheral pigmentation R.E., 20/120; L.E., 20/80	Outward Downward	Outward Upward	XT, LH	ET	Chorioretinitis (? retrolental fibroplasia)
Triebenstein (Case 1)	Peripheral pigmentation R.E., 20/50; L.E., very poor	Normal	Upward Outward	XT	ET	Chorioretinitis (? retrolental fibroplasia)
Triebenstein (Case 2)	Peripheral pigmentation R.E. counting fingers 10 ft.; L.E., 20/40	Outward Upward	Outward Downward	XT	None	Chorioretinitis (? retrolental fibroplasia)
Beselin	Peripheral pigmentation Chorioretinal scarring	Outward Upward	Outward Upward	XT	None	Chorioretinitis
Bielschowsky	Chorioretinal scarring "three-fourths normal," O.U.	Upward	Downward	ET, RH	XT, LH	Chorioretinitis
Friedman	Macular disciform lesion R.E. 20/400; L.E., 20/15	Downward Inward	Normal	RH	None	Trauma: Chorioretinitis
Cohen & Weisberg	R.E., 20/30–2 L.E., 20/20–2	Outward Downward	Outward Upward	XT, LH	ET, RH	Congenital
Blaxter	Microcornea Peripheral scarring superiorly Traction bands to macula R.E., 20/20; L.E., 20/40 Premature birth	Normal	Upward	LH	None	Chorioretinitis ? retrolental fibroplasia
Trevor-Roper	Retinal traction bands History of subsided retinal detachment Vertical diplopia	Downward		None	None	Inflammatory
Horwich & Linfesty	Scarring, lower temporal periphery Facial assymetry O.U., 20/20	Inward Downward	Normal	LH	RH, XT	Chorioretinitis
Payne & Crick (Case 1)	Lesions in temporal periphery History of premature birth R.E., 20/40; L.E., 20/20	Outward	Normal	XT	ET	Retrolental fibroplasia
Payne & Crick (Case 2)	Retinal folds History of premature birth	Outward	Outward	XT	None	Retrolental fibroplasia
Payne & Crick (Case 3)	Old retinal periphlebitis Diathermy scarring Folds from scarring to disc Diplopia	Downward	Normal	RH marked	RH slight	Inflammatory

TABLE 1 (*Continued*)

Author	Associated Findings	Position of Macula R.E.	L.E.	Strabismus Apparent	Actual	Probable Etiology
Foulds	Chorioretinal scarring, lower periphery R.E., 20/200; after occlusion, 20/20 L.E., 20/15	Downward	Normal	LH	RH	Chorioretinitis
Ellis (Case 1)	Retinal bands, O.U. Area of depigmentation, R.E. R.E., 20/300; L.E., 15/20 History of premature birth	Outward	Outward	XT	E	? Retrolental fibroplasia ? Chorioretinitis
Ellis (Case 2)	Retinal bands, O.U. History of premature birth R.E., 6/200; L.E., 20/100	Inward Downward	Normal	ET	ET, RH	? Retrolental fibroplasia
Rados & Scholz (Case 1)	History of premature birth Scarring left temporal peripheral fundus R.E., 20/30; L.E., 20/100+1	Normal	Outward	XT, LH	ET, LH	? Retrolental fibroplasia
(Case 2)	Retinal folds and peripheral scarring History of premature birth O.U., 20/70	Outward	Outward	XT	E, LH	? Retrolental fibroplasia
(Case 3)	Temporal peripheral pigmentation & scarring History of premature birth, nystagmus R.E., 20/70; L.E., 20/30	Outward	Normal	XT	E	? Retrolental fibroplasia
(Case 4)	Large retinal fold, L.E. History of premature birth R.E., 20/50; L.E., 20/200	Normal	Upward	X	ET, LH	? Retrolental fibroplasia
(Case 5)	Temporal pulling of vessels R.E., 20/200; L.E., 20/30 after patching	Outward	Outward Downward	X	ET, LH	? Retrolental fibroplasia
(Case 6)	Lesions in temporal periphery, L.E. R.E., 20/30; L.E., 20/50 O.U., 20/20 after patching, R.E.	Normal	Outward	XT	E	? Retrolental fibroplasia
(Case 7)	Glial reaction temporal to right disc Temporal pulling of retinal vessels R.E., 20/100; L.E., 20/20 R.E. improved to 20/50 after occlusion L.E.	Outward	Normal	ET	XT	Retrolental fibroplasia
(Case 8)	Anisometropia with high myopia, L.E. Peripheral change & traction bands, L.E. Birth weight about two lb.	Normal	Upward Outward	X	ET	Retrolental fibroplasia

reveal no shift at all, or indeed may reveal a strabismus just the opposite of what was thought to exist. Although there appears to be eccentric fixation, the patient on ophthalmoscopic examination will be seen to fix with the macula. And, of course, fundus examination will reveal the macula to be in an abnormal position. Visual acuities will vary

from normal to extremely low. When an actual strabismus exists and the macula is not damaged, an amblyopic eye may be found which will often respond to patching.

Patients with heterotopia maculae present several problems as regards surgery. It is impossible to obtain both a cosmetic and functional result. For example, any surgery undertaken to correct an actual esotropia, where there is apparent divergence, will make the patient cosmetically more exotropic. Conversely, surgery undertaken to reduce the appearance of an exotropia will, if the patient is esotropic, only aggravate the actual strabismus, or if the patient is orthophoric may produce a strabismus where none existed before. Surgery for cosmetic purposes might be undertaken in those cases where an amblyopia exists and there is no hope for restoration of vision, but results in such cases will usually be disappointing. It would therefore appear to be mandatory to rule out the presence of heterotopia maculae in all patients presenting themselves with muscle problems.

Summary

The literature on heterotopia of the macula has been reviewed and eight additional cases have been presented.

Several theories as to the etiology of this condition have been discussed.

Clinical features and their application to the management of heterotopia maculae have been discussed.

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AN ANALYSIS OF 142 CASES OF PTOSIS*

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This study is based on a personal survey of the hospital record of 142 consecutive patients with blepharoptosis admitted to Los Angeles Childrens Hospital from 1945 to 1956, inclusive. Surgery was deferred in 16 cases, while in the remaining 126 patients, 181 operations, using some 17 techniques of ptosis repair, were performed by the ophthalmology attending and resident staffs. When the latter performed the surgery, they were under the direct supervision of the senior staff. In all private cases, which consisted of less than one half, the attending doctor performed the operation, usually assisted by the resident.

All clinic cases were seen in the eye clinic, where they were evaluated by the eye staff and mode of management determined. When the case appeared unusually difficult, the patient was seen in consultation by other members of the staff. Occasionally, a case required presentation to the eye conference.

In private cases, the ophthalmologist completed the work-up in his office, although the eye resident in a few cases had the opportunity of seeing the patient and could make a few observations regarding the eye findings.

In both cases, clinic and private, a careful history was taken by the pediatric intern and/or resident. This included history of the present illness, family history, past illness, birth history, maternal history, and all details necessary to a complete pediatric evaluation.

As to the eye findings, these were recorded during the patient's visit to the eye clinic by various members of the attending and resident staffs. The work-up for ptosis included:†

1. Evaluation of visual acuity, with or without glasses, usually using the E-game or the picture chart in those unable to read.
2. Calculation of the amount of ptosis.
   a. Unilateral or bilateral.
   b. Measurements were made in various ways. Some measured with a millimeter rule placed over the palpebral fissure, one thumb immobilizing the frontalis, as the patient looked straight ahead, down, and

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† Because of the lack of co-operation in many children (too young or mentally retarded), it was most difficult to do a complete and accurate work-up. It was almost impossible to be certain that the function of the extraocular muscles, especially the superior rectus on the ptotic side, was not impaired.

up. Others simply noted how much of the pupil or cornea was covered by the upper lid.

3. Evaluation of the levator.

4. Evaluation of the superior rectus.

5. Muscle balance: esotropia, exotropia, hypertropia, and so forth.

6. Frontalis overaction, especially in bilateral ptosis.

7. Chewing of gum by patient to detect jaw-winking phenomenon.

8. General appearance of the palpebral fissures, canthi, and lids.

9. General appearance and head position of the patient: mongoloid facies, torticollis, head tilt, and so forth.

10. Measurement of the width of tarsal plate, especially when previous surgery had been done.

11. Refraction, usually under cycloplegia.

12. Tests to rule out other conditions, when indicated:

a. Prostigmin test to rule out myasthenia gravis.

b. Cocaine test to rule out sympathetic ptosis.

c. Corneal sensitivity test to rule out any unhealthy condition of the cornea.

13. Preoperative photographs.

Cases of transient ptosis associated with encephalitis requiring no intervention aside from treatment for the primary disease, and ptosis seen in myasthenia gravis, in lid hemangioma, and in Duane's retraction syndrome, were not included in this series.

Classification

Ptosis may be congenital or acquired. In this series of 142 cases, only four were definitely acquired: one resulted from trauma during an automobile accident, another followed a chronic attack of vernal catarrh, a third resulted from neurofibromatosis, and a fourth was associated with lacrimal gland tumor. In one case, a borderline bilateral ptosis was present at birth, which was later aggravated by a severe attack of scarlet fever.

TABLE 1

Classification of congenital ptosis (138 cases)

I. Simple Levator Weakness (simple uncomplicated) fig. 1 (a–c)		71
A. Some levator function	68	
B. No levator function	3	
II. Levator Weakness, with Muscle Imbalance (simple complicated) fig. 1 (d–f)		42
A. Some levator function	37	
1. Hypotropia*	20	
a. Sup. rectus inv.	15	
b. Inf. oblique inv.	5	
2. No hypotropia	17	
a. Esotropia	8	
b. Exotropia	6	
c. Unclassified	3	
B. No levator function	5	
1. Third n. paralysis, unilateral	4	
a. Complete fig. 2 (c–d)	1	
b. Partial	3	
2. Third n. paralysis, bilateral	1	
a. Complete	0	
b. Partial	1	
III. Levator Weakness, with Other Lid Defects		19
A. Epicanthus & blepharophimosis [fig. 2 (a–b)]	9	
B. Epicanthus only	6	
C. Blepharophimosis only	1	
D. No lid folds	2	
E. Markedly unequal lid folds	1	
IV. Ptosis, with Jaw-Winking		6
A. Muscle balance impaired	4	
B. Muscle balance intact	2	

* Slight horizontal deviation present in a few.

Influenced by Duke-Elder,[1] Berke,[2] and Spaeth,[3] I have classified the 138 congenital ptosis cases in this series in Table 1.

Sex distribution

Of the 138 congenital cases, 83 were males and 55 females. Of those in which the ptosis was associated with anomalies of the lid, 10 were males and nine females. But in the six with jaw-winking, sex distribution was even.

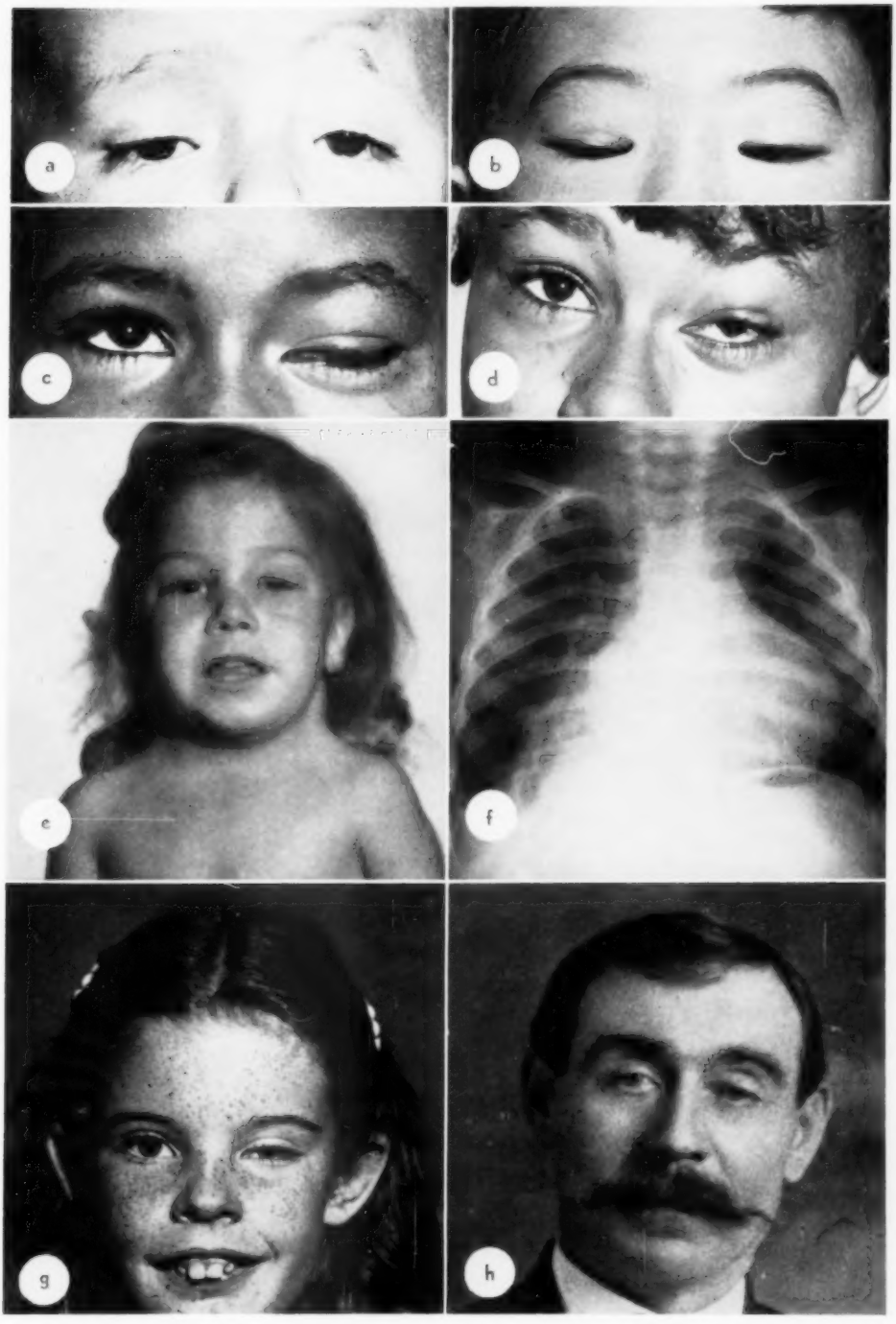
Unilateral or bilateral

Ptosis was unilateral in 105 and bilateral in 33. Of the unilateral, the left eye was affected in 61, the right eye in 44. It is interesting to note that in the six Marcus Gunn cases, ptosis was unilateral in all, and

Fig. 1 (Carbajal). (a, b, c) Example of simple uncomplicated ptosis. (a) Primary position. (b) Looking up. (c) Looking to the right. (d, e, f) Example of simple complicated ptosis after ptosis repair in O.S. and bimedial recession—primary position; looking up; looking down, showing lagophthalmos. (g, h, i) Example of overcorrection in acquired ptosis—primary position before surgery; looking down, showing extreme lagophthalmos about a month postoperatively; difficulty of closing the eye.

→

Fig. 2 (Carbajal). (a, b) Examples of ptosis with epicanthus and slight blepharophimosis. (c, d) Case of unilateral complete third-nerve paralysis—four years prior to surgical intervention; one month after ptosis repair and three months after transplantation of superior oblique tendon to left medial rectus stump and recession of left lateral rectus. (e, f) Bonnevil-Ulrich syndrome, showing left ptosis and webbed neck (e) and x-ray evidence of coarctation of the aorta (f). (g, h) Patient's (g) grandfather (h) had ptosis on same side (O.S.).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in the left eye in all except one. Even in the bilateral cases, there was a trend for the left eye to be worse: O.S., 12; O.D., seven; same in 12. This remains to be explained.

Causative factors

In this study, the possible etiologic or causative factors were considered with special interest. Except in four acquired cases, all were of the congenital type. On further analysis, however, the 138 congenital cases in this study might be further subdivided into (1) the true congenital and (2) those possibly acquired at birth.

True congenital blepharoptosis occurs when there has been some fault in development of the third-nerve nucleus and/or the levator muscle itself.[1,15] According to most embryologists (Mann,[4] Falls,[5] and others), it is not so much the type of trauma or insult as the stage of organ development when such injury happens that determines the type of congenital defect. Premised on this observation, the fetal disturbance must have occurred at the height of the levator muscle development or that of the third-nerve nucleus.

The role played by birth trauma or abnormal pregnancy is difficult to appraise.[6] In this series, birth history was available in 121 cases, 34 of which gave a history of abnormal labor and delivery as shown in Table 2. Moreover, there were 16 cases, in five of which ptosis was bilateral, where certain congenital defects (table 3) besides those affecting the levator and other extraocular muscles or lids, were present. These defects were sometimes seen in combination. For example, tetralogy of Fallot and left facial hemiatrophy; hypertelorism and inguinal hernia; cryptorchidism and inguinal hernia; and so forth. It is noteworthy that, in the cases with congenital defects other than ptosis, only four had a history of difficult labor or instrumentation which could not satisfactorily account for any defects except ptosis. This indicates that the congenital defects had taken place in the fetal stage of development and that the difficulties at term might or might not have aggravated any preexisting ptosis.

TABLE 2

Incidence of abnormal pregnancy and birth trauma in congenital ptosis

Instrumentation (forceps applied)	15
Forceps pressed on lid in one	
Prolonged and Difficult Labor	6
Breech presentation in one	
Forceps applied in one	
Breech Presentation	5
Forceps applied in one	
Cesarean Section	5
Severe hemorrhage in one (Placenta previa?)	
Fibromyomata of uterus in one	
Toxemia of Pregnancy (moderate)	1

In the 87 cases in which pregnancy, labor, and delivery were uncomplicated, there is little doubt that the ptosis was purely congenital. Twelve had evidence of other congenital defects besides those of the eye. Of the 34 with birth complications, four had congenital defects that could not be ex-

TABLE 3

Incidence of other congenital defects in congenital ptosis

Hernia	4
Cleft palate*	3
Congenital heart disease	3
Cryptorchidism	3
External ear malformation	2
Harelip	1
Club foot	1
Hypertelorism	1
Mongoloid facies	1
Cerebral palsy	1
Cerebral defect (?)	1
Partial absence of parietal and occipital bones	1
Convulsive seizures	1
Facial hemiatrophy	1
Weakness of right extremity	1
Ovarian agenesis	1
Kidney anomalies	1
Webbing of neck	1
Many congenital defects (but not specified)	1
Bonnevil-Ulrich syndrome† (See Fig. 2 (e, f)	1

* In one case, there were three children in the same family that had both harelip and cleft palate.

† This case had ptosis, coarctation of aorta, webbing of neck, agenesis of right kidney, multiple pelves in left kidney, external ear malformation, ovarian agenesis, and mediastinal tumor.

TABLE 4

FAMILIAL TENDENCY IN CONGENITAL PTOSIS

Relationship	Number of Cases
Grandparents (fig. 2 (g–h))	4
Father	2
Mother	2
Sister	2
Cousin	2
Uncle	1
Aunt	1
Not specified (four or five cases in two generations)	1

plained simply by birth injury. In the remaining 30, the role played by trauma is hard to ascertain.

Family history was available in all except 25 cases. In 14 patients, there was evidence that an immediate member of the family (table 4) or a close relative had ptosis.

Refractive status

Cycloplegic refraction was done in 30 patients.* The refractive error was greater, by not less than half a diopter of either sphere or cylinder or both, in the affected eye in 12 patients, in the normal eye in four, and practically the same refractive status was seen in 12. In two patients, refraction was done but was unsatisfactory. Of those with the same refractive status seven patients had bilateral ptosis, three of whom had approximately equal amounts of lid-droop, while in the remaining four, the difference between the two palpebral fissure measurements was negligible.

Visual acuity

Because of the difficulty of obtaining cooperation in young children, visual acuity (mostly without glasses) was satisfactorily taken in only 37 patients. The affected eye had visual acuity at least one line poorer than the normal eye in 24 children. Vision was recorded as equal in nine patients, two of whom had bilateral ptosis. The affected eye had slightly better vision than the normal in four. In three of these, there was bilateral ptosis of slight difference in the two eyes; and in one of the three, there was a divergent squint, the eye with less lid-droop turning out most of the time. In the lone unilateral case, the droopy eye had 20/20 in contrast to 20/30 in the normal eye. Unfortunately, refraction was not done in this case so that no clear-cut explanation is available.

Mode of management

Of the 142 cases, 126 underwent surgery for blepharoptosis, the operation being deferred in 16 patients. In six patients with bilateral ptosis, surgery was done on both lids at the same operation, each of which was counted as one operation. Three patients had had some kind of surgery done on their eyes before coming to the Childrens Hospital and, therefore, the operations were not included in this survey.

In summary, of the 181 ptosis operations (table 5), 137 were performed as primary procedures, 30 as secondary, and 14 as repeat procedures. The most widely used primary procedures in the Childrens Hospital were those of Trainor[7] and of Blascovicz.[8] Everbusch's[9] technique was more popular as a secondary procedure, being done on three occasions after levator shortening failed, and in two instances after Trainor's method proved inadequate. It is interesting to note that the Friedenwald-Guyton[10] method, utilizing tantalum wire, was used as a primary procedure in 14 operations, as a secondary procedure in 10, and as a repeat procedure in six.

Operations other than ptosis repair included: operations to correct the muscle imbalance† before or after ptosis repair; repair of epicanthus and/or blepharophimosis; removal of multiple chalazia in preparation

* Some were in infancy so that refraction was not done.

† In one case, ptosis repair and bimedial recession (for esotropia) were done in one operation (fig. 1 d–f).

TABLE 5

VARIOUS TYPES OF PTOSIS SURGERY PERFORMED IN CHILDRENS HOSPITAL, 1945–1956

Types of Surgery Utilizing:	Number of Cases Done as:* Primary Procedure	Secondary Procedure	Repeat Procedure	Total	
Levator					74
Blascovicz	37	4	1	42	
Modified Blascovicz	4	0	0	4	
Berke	9	1	0	10	
Modified Berke	4	0	0	4	
Everbusch	1	5	0	6	
Levator tucking	3	1	0	4	
Leahey[14]	1	1	0	2	
Resection & detachment†	2	0	0	2	
Superior Rectus					56
Trainor	40	0	3	43	
Modified Trainor	1	0	1	2	
Motais	4	2	2	8	
Dickey[20]	2	1	0	3	
Berke	1	0	0	1	
Frontalis					51
Friedenwald-Guyton:					
Tantalum	14	10	6	30	
Silk	3	2	1	6	
Cotton	3	0	0	3	
Fascia lata	1	0	0	1	
Pagenstecher's	2	0	0	2	
Reese	5	3	0	8	

* Primary procedure: first attempt to correct ptosis surgically. Secondary procedure: following another type of surgery that failed. Repeat procedure: same procedure done all over.
† In Marcus Gunn cases.

for the primary procedure; exploration of a ptosis case, in which a Motais procedure[11] was found; operations to correct complications of ptosis surgery, such as repair of entropion (Ziegler cautery, van Milligen sutures); plastic surgery for lid fold; recession of levator; and suturing back a structure that had slipped off.

EVALUATION OF PTOSIS PROCEDURES

In unilateral ptosis surgery in this series, the success of each procedure was judged mainly by the gross amount of improvement of the appearance of the "ptotic eye," that is, how much the palpebral fissure measurement in the primary position had approximated that of the normal eye.

In bilateral ptosis, it was extremely difficult to make both palpebral fissures equal, which object was also one of the eight criteria[12] in evaluating the success of a ptosis operation. However, in only a few of the cases that had adequate follow-up were palpebral measurements taken in the primary, up, and down positions of gaze.

Based simply on cosmetic appearance, most of the cases were fairly satisfactory or implied to be so, while those that were not ultimately satisfactory and required further repair are grouped as follows:

	CASES
Undercorrection	12
No improvement at all	4
Overcorrection	3
Ptosis made worse	2

Another way of appraising the result in a surgical procedure was to find out how many of the cases undergoing such procedure failed, and consequently had to be re-operated (table 6). There were 32 cases requiring another procedure and, of these, three had to be worked on further, one undergoing six operations in both eyes. As previously mentioned, there were three cases that had had ptosis surgery before coming to the Childrens Hospital. These also under-

TABLE 6

PTOSIS PROCEDURES REQUIRING OPERATION*

Ptosis Procedures	Number of Cases Done: as Primary Procedure	Requiring Another	Gross Percent of Success
Blascovicz	37	8	80
Berke	9	3	66
Modified Berke	4	2	50
Trainor	40	8	80
Modified Trainor	2	1	50
Motais	4	2	50
Friedenwald-Guyton:			
Tantalum	15	3	80
Silk	3	1	66
Cotton	3	3	0
Reese	5	1	80
Done as Secondary Procedure			
Friedenwald-Guyton (T)	10	3	70
Dickey†	1		
Done as Repeat Procedure			
Trainor	3	2	33

* The percentage of gross success is 80 percent in Blascovicz, Trainor, Friedenwald-Guyton (utilizing tantalum), and Reese. Statistically, however, in this series only the techniques of Blascovicz, of Trainor, and of Friedenwald-Guyton, have been done in fairly sufficient number.

† This case failed, but parents refused further surgery.

went multiple ptosis procedures. One drawback in taking this as a basis of evaluating a surgical procedure is that it is possible that a few parents were contented with the slightest improvement, or a few simply decided not to do anything about the cosmetic inadequacy.

Still another way of appraising ptosis procedures was to note which were accompanied by complications, and to determine how severe the complications were.

COMPLICATIONS

Although, according to the hospital record, only 68 patients had complications from ptosis surgery, it is possible that others could have had some trouble, but might have gone elsewhere for care or did not return for further follow-up.

For the sake of convenience, ptosis surgery complications or mistakes were classified according to the time they occurred, thus: (1) preoperative, (2) operative, and (3) postoperative.

Preoperatively, the presence of jaw-winking was not discovered in two patients until the day of surgery. The variability of the amount of ptosis in one case was not recognized.

During operation one case was discontinued because the heart tones failed and respiration ceased, while in another patient, the apnea and cyanosis were brief so that surgery could be continued. In one case, the Motais operation had to be discontinued in favor of another, due to injury to the middle third of the superior rectus muscle.

Most of the complications occurring postoperatively were recorded in all patients followed in the eye clinic. Of the private patients, only the notes made by the staff immediately after surgery and after the first dressing gave evidence of complications. In the private patients that had to be rehospitalized, the complications were clearly recorded.

In Table 7, these postoperative complications are classified and arranged according to frequency.

A breakdown of the ptosis techniques relative to the five most common postoperative complications observed in the Childrens Hospital is shown in Table 8.

TABLE 7

POSTOPERATIVE COMPLICATIONS IN PTOSIS SURGERY

Type of Complication	Number of Cases	
Lagophthalmos		13
Skin complications:		11
Abscess	5	
Granuloma	3	
Keloid	2	
Fistula	1	
Entropion		7
Corneal ulcer		7
Hypotropia of ptotic eye		4
Complications brought about by another trouble* postoperatively		4
Infection (chalazion, blepharitis)		3
Allergy (to cotton, etc.)		3
Complications relative to technique		18
Sutures gave way	4	
Tongue of superior rectus slipped	3	
Tongue of tarsus slipped	1	
Levator pulled away	3	
Tantalum broke through	1	
Others	6	
Miscellaneous		10

* Examples: varicella, gastro-enteritis, scleroderma (leading to ectropion), and laryngeal edema.

As previously mentioned, the minor operations performed to correct a complication were not included as ptosis surgery. If they had been taken into account, the number of operations per patient would have been appreciably increased, as in many of the cases that developed some complication the patients had to be subjected to corrective surgery. For example, in the patients in which Trainor's technique was used, the entropion and subsequent corneal irritation sometimes necessitated placement of van Milligen sutures or Ziegler cautery under general anesthesia. In all the Friedenwald-Guyton cases with sterile abscess, purulent knot, or granuloma, the suture (tantalum, cotton, or silk) had to be extracted and the patient had to wait a few weeks before another operation could be done. Recession of the levator had to be performed on one patient with lagophthalmos* (fig. 1 g-i) who had undergone a modified Berke's procedure.

At this point, we should be reminded again that variable results are obtained in even identical techniques performed by different doctors. In a large hospital where the eye staff consists of many members trained differently as to the surgical management of ptosis, the percentage of success is hard to determine and to predict.

* The ptosis in this case was secondary to lacrimal gland tumor, which was successfully removed.

COMMENT

In this series, congenital ptosis affected the male (83) more frequently than the female (55). Briggs[13] reported 64 cases of congenital ptosis in 23 families, 33 being in males, 30 females, and one of unknown sex.

Of the 138 congenital cases reported in this paper, 105 (or approximately 76 percent) were unilateral and 33 (or 24 percent) were bilateral. These figures approximate those of Spaeth[3] and of Berke.[2]

TABLE 8

PERCENTAGE OF COMPLICATIONS IN PTOSIS PROCEDURES*

Complications: Ptosis Procedure	Number of: Cases with Complications	Number of: Operations (Total)	Percent of Complications
Lagophthalmus:			
Trainor	3	43	7
Motais	3	8	37
Blascovicz	2	42	5
Modified Berke	2	4	50
Modified Blascovicz	1	4	25
Friedenwald-Guyton†	1	29	3
Everbusch	1	6	17
Abscess, purulent knot, or granuloma at site of incision:			
Friedenwald-Guyton:			
Tantalum	7	30	23
Silk	1	6	16
Cotton	3	3	100
Entropion:			
Trainor	6	43	14
Modified Trainor	1	2	50
Corneal Ulcer:			
Trainor	6	43	14
Modified Blascovicz	1	4	25
Hypotropia of ptotic eye:			
Trainor†	3	43	7
Motais†	1	8	12

* Statistically, it is not fair to judge a certain technique by basing findings on an inadequate number of cases. In this series, only those of Trainor, Blascovicz, and Friedenwald-Guyton may be counted as fairly adequate.

† Figures here are surprisingly low.

The cause of congenital ptosis in this series was not well explored. In the five cases in which biopsy of the levator muscle was done, there was evidence that the muscle fibers were sparse and replaced in places by fibrous or fatty tissue. This is in accord with Berke and Wadsworth's findings[15] in their study of the levator muscle in congenital ptosis and with Duke-Elder's[1] statement that the pathogenesis of simple congenital ptosis in most cases is probably a lack of peripheral differentiation of the muscles.

Wilbrand and Saenger[16] found degenerative changes in the third-nerve nucleus of a man with bilateral congenital ptosis who died of tuberculosis. However, they did not study the orbits or the levator muscle. In a case of simple left-sided congenital ptosis, Siemerling (1892)[17] described degeneration of the cells of the left oculomotor nucleus in the more proximal levels.

Birth injuries were possible in 34 instances in this review of ptosis patients but in only one instance was there reference made that forceps had directly injured the upper eyelid in one eye. It is possible, however, that one or more could have been similarly injured. According to Edgerton,[18] the remote effects from intracranial hemorrhage and trauma often result in ptosis, nystagmus, defective vision from disease of the ocular tract, and paralysis of the ocular muscles.

Berkeley[19] stated that fracture of the skull or laceration of the tentorium might produce intracranial hemorrhage followed by ptosis of the lids, paralysis of the external rectus muscle, or a combined paralysis of the sixth and seventh nerves. Ptosis is frequently observed at birth but usually disappears in a few days according to Holt[20]; when it fails to improve, however, it may be due to a defect in development or absence of the levator muscle.

The influence of heredity was definitely shown in 14 cases here. This was especially true in those cases with some other defects such as epicanthus, blepharophimosis, torticollis, hypertelorism, and congenital heart disease. In three cases with unilateral lid-droop, the father or mother or grandfather (fig. 2 g-h) had ptosis on the same side as that of the offspring. In one case with bilateral ptosis, blepharophimosis, epicanthus, and congenital deafness, family history revealed five members with congenital ptosis in two generations.

The genealogy reported by Briggs,[13] which traces six generations showing a direct transmission, supports the fact that the genetic factor is important in the etiology of congenital ptosis. Rodin[21] reported the pedigree of four generations in which hereditary congenital ptosis affected only one eye, and the pedigree of one generation in which bilateral congenital ptosis was associated with epicanthus.

From the facts cited thus far, one may safely conclude that congenital ptosis may be the result of a genetic defect, or of injury taking place in the embryonic or fetal stage of development or right at birth. Any type of ptosis starting from any cause after birth will fall under the acquired group.

When congenital ptosis is severe, the drooped lid may influence the normal growth of the cornea; hence, in unilateral ptosis it may account for a certain degree of anisometropia. However, the statistics here are not sufficiently adequate to bear this out.

A few words must be said about the prevention of complications in ptosis surgery. The age-old adage "an ounce of prevention is better than a pound of cure" is especially applicable in ptosis surgery because once a mistake is committed in the first procedure, especially in levator shortenings, the chances of obtaining a perfect result are diminished considerably. Because the operation is a form of plastic surgery devised to improve the patient's appearance, anything short of perfection may make everybody unhappy—the patient, the parents, and the surgeon himself. Moreover, ptosis surgery is unlike

strabismus procedures, where imperfections can be more easily smoothed out by another operation, or where orthoptists can be of great help.

The prevention of complications is difficult in view of the fact that certain ptosis techniques and certain complications are closely associated—or even inseparable. A review of the literature reveals a number of complications encountered in specific types of blepharoptosis surgery.

For example, Wiener[22] mentions the incidence of entropion and corneal ulcer resulting from irritation by the turned-in lashes immediately after a Trainor surgery, to prevent which, he suggests pasting the lashes against the skin of the lid with collodion. According to Meller,[23] a drawback of Blascovicz's method is the difficulty for the patient to close the palpebral fissure, and the shortening is conspicuous on looking down.

In Motais' procedure, the following complications[23, 24] have been reported: (1) lagophthalmos, especially during sleep, (2) corneal ulceration, (3) diplopia and heterophoria, (4) herniation of orbital fat into the conjunctival wound, and (5) arching of the lid margin.

Complications seen when blepharoptosis is treated by the Friedenwald-Guyton suture[10, 25] include: (1) breaking of suture in cases of a blow to the lid, (2) infection—early and late, (3) keloid, (4) exposure keratitis, (5) postoperative trichiasis, (6) limitation of motion of eyelid, and (7) lagophthalmos.

In his procedure, which is fast becoming as popular as that of Blascovicz's, Berke[26] cites such complications as (1) temporary overcorrection, (3) keratitis—mild or severe, (3) muscle imbalance, and (4) postoperative lagophthalmos.

There are many other complications but enough have been mentioned to help us see that a certain operation is associated with certain complications, some of which, fortunately, straighten out with the passing of time. Another glance at Table 7 will unfold the fact that most of the complications just enumerated have been seen in Los Angeles Childrens Hospital.

What may be done to diminish or even prevent complications?

First, the type of blepharoplasty technique should suit the case. Second, the surgeon should be adequately equipped for the job. This implies not only such useful instruments as Berke's ptosis clamp, Jaeger's lid plate, ligature carrier, and so forth, but also a working knowledge in surgical anatomy* (particularly of the lid, levator, and nearby structures) and the surgical technique chosen. Third, both parents and patient should be able to co-operate with the surgeon, as careful postoperative care and follow-up are very important.

To find out which of the over 80 ptosis operations should fit the patient best, a thorough work-up, as outlined in the first part of this paper, is imperative. Special stress should be placed on appraising how much action the levator muscle has, as well as the superior rectus, because the choice of surgical technique, in a large measure, depends on this.

At this juncture, the classification of congenital ptosis suggested at the beginning of this paper (table 1) should be reviewed.

I. In simple uncomplicated ptosis where some levator function is elicited, the most ideal type of surgery is resection of the levator muscle. When there is no levator action, an operation utilizing the superior rectus is in order, especially in bilateral cases.

II. In simple complicated ptosis (levator weakness associated with muscle imbalance), the muscle difficulty, if more marked than the ptosis, should first be straightened out. This is particularly true in complete third-nerve paralysis, where transplantation of the superior oblique tendon to the medial rectus and recession of the external rectus (fig. 2 c-d) may prove of some help. On the other

* Berke's studies [15, 26, 27] on this have been most stimulating.

hand, if the ptosis poses a greater problem, this should demand correction first. Granting that there is a good functioning levator, the ideal surgery would be as under I, but one should bear in mind Berke's finding[26] that where the superior rectus is weak, a proportionately more liberal levator resection is in order. If there is no levator function and there is underaction of the superior rectus, then a sling-operation utilizing the frontalis[10, 28] or both the frontalis and levator[24] muscles is advisable.

III. When levator weakness is associated with other lid defects, the latter may be corrected separately or simultaneously with the ptosis. Since in this group the superior rectus is often involved, any surgery overtaxing this muscle further should be avoided. Also, since most of these cases usually have bilateral ptosis associated with active frontalis muscles, utilization of the sling-type of ptosis surgery as mentioned under II is ideal, if there is any doubt regarding levator function.

IV. In cases with ptosis associated with jaw-winking,* surgery may be done if the ptosis is marked and the jaw-winking is quite annoying. Otherwise, they should be left untouched.

Logically, the next question is: Which of the many techniques of levator shortenings should be done? Which of the superior rectus types? Which of the sling operations?

Of course, it is easy to say that the most physiologic operation should be done—one that improves not only the looks but also the function; one that lasts not only for a few weeks but for as long as the patient lives. Then, too, the surgeon would do a technique that he knows by heart better than one with which he is not familiar.

It is also important that the surgeon should be able to detect complications right at the start, before they turn out irremediable, and be prepared to manage them accordingly.

Equally important is the proper timing of the surgery. All surgeons agree that the tissues in and around the eyelid are quite fragile in early childhood. For this reason, a definitive surgery, like resection of the levator or utilization of the superior rectus, is likely to fail if done before the age of three years. Moreover, ptosis surgery complications are more likely to occur in the very young children than in older ones because of lack of co-operation and understanding. On the other hand, when amblyopia or psychologic traits or parental complexes begin to creep into the picture, a temporizing type of surgery may be worth trying, like modifications of the Friedenwald-Guyton or Bettman[29] techniques.

Many ptosis surgery techniques have come and gone. Some were good for certain cases but unfortunately were misapplied. It is suggested, therefore, that the eye surgeon should refrain from making all patients suit a favorite technique, but rather choose the one that suits the patient best. It is emphasized again that once a mistake is made in the choice of the first procedure, or in the actual surgery itself, the chances for success will not be as good in the second surgical intervention, and much less in the third.

Summary

The work-up, both diagnostic and remedial, of 142 consecutive cases of ptosis admitted to Childrens Hospital is presented. Complications encountered in the surgical management and their prevention have been emphasized. A modified classification of congenital ptosis is offered to help the surgeon in deciding which ptosis procedure to use. The causative factors in congenital ptosis are enumerated.

635 South Westlake (57).

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* I expect soon to publish a paper dealing with a few cases in which surgery was done for ptosis associated with jaw-winking.

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NOTES, CASES, INSTRUMENTS

SUBRETINAL CELLULAR DEPOSITS*

In melanoblastoma of the choroid

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Amsterdam, The Netherlands

In a previous paper disseminated pigmentary deposits occurring in melanoblastoma were described. In cases in which the toxic influence of the tumor is limited, the cells of the pigment epithelium show little regressive changes but proliferate and desquamate. They are transported by the subretinal current of albuminous exudate described by Samuels, and the clinical picture of "taches noirâtres" (Zeeman) in an apparently normal retina may appear in ophthalmoscopy.

It was shown that in other cases the cells of the pigment epithelium are more severely affected and even may not be recognizable as such. They may lose their pigment and even become necrotic. Instead of the minimal

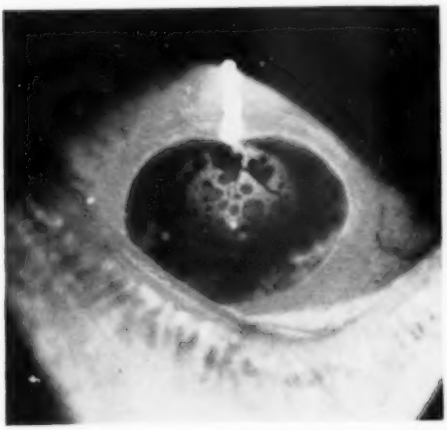

Fig. 1 (Hagedoorn). Secondary detachment in melanoblastoma. Precipitates on posterior surface of the detached retina. (Reflected illumination from the fundus oculi.)

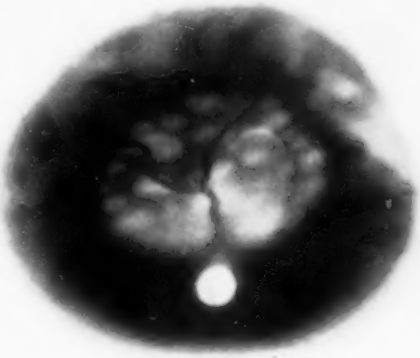

Fig. 2 (Hagedoorn). Secondary detachment in melanoblastoma. Precipitates on posterior surface of the detached retina.

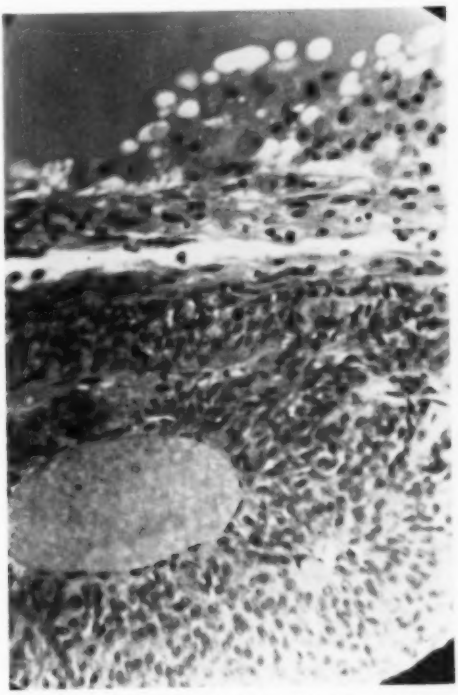

Fig. 2A (Hagedoorn). Cells of the precipitates "in situ" on the proliferation of the cells of the pigment epithelium.

* From the University Eye Hospital. This is a Blaauw fund publication.

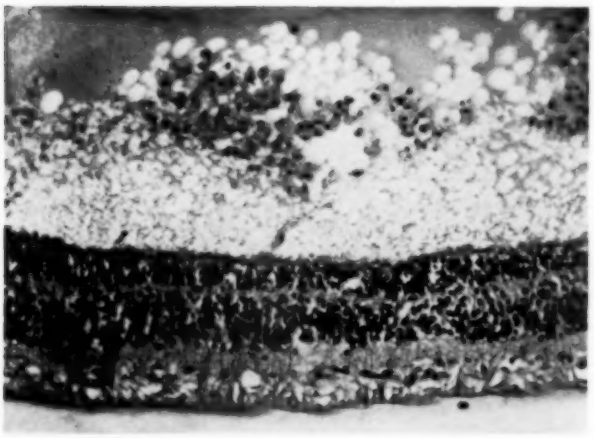

Fig. 3 (Hagedoorn). Detached retina with precipitates on the posterior surface. (×90.)

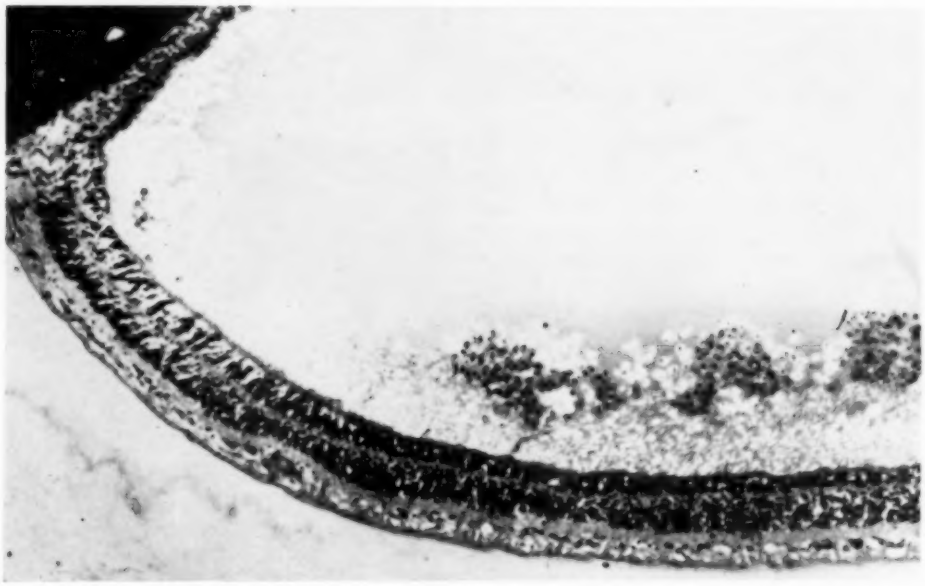

Fig. 4 (Hagedoorn). Precipitates. (×18.)

detachment described by Samuels, a more abundant production of albuminous exudate may occur so that a prominent secondary detachment of the retina is seen on ophthalmoscopic examination.

The combination of this detachment with the conglomerations of partly necrotic cells in the subretinal fluid may give rise to an ophthalmoscopic picture which probably may have been described previously but of which I could not find a good illustration. Figures 1 and 2 show the detached retina with the subretinal precipitates under two different illuminations. The grayish precipitates are dark in the light reflected from the fundus. The photographs were made by Mr. G. Lammens who succeeded in getting a good illustration of the clinical aspect of the condition

by adjusting the anterior lens of the Zeiss fundus camera.

In Figure 2A, which shows a section through the eye, the conglomerations of (sub)necrotic cells are seen behind the detached retina on the tumor. Figures 3 and 4 demonstrate that these cells have suffered severely and lost most of their pigment. It is no longer possible to determine their nature with certainty but their origin from pigment cells is highly probable. At some places glial elements from the degenerated retina over the tumor cannot be separated from proliferated elements of the pigment epithelium.

The tumor tissue, itself, is generally well marked off, though it may invade proliferations of the pigment epithelium and a degenerated retina. The tumor cells in this case definitely did not show a tendency to desquamate from the surface of the tumor into the subretinal space and no transition stages to subretinal (necrotic) cells could be traced.

Of course, it cannot be denied that tumor cells may be present in the subretinal fluid in other cases in which tumor growth penetrated the layer of tissue derived from pigment epithelial cells or retina. The precipitates presented in this case, however, had to be considered derivatives of the pigment epithelium. It cannot be excluded that similar subretinal precipitates may occur in detachments secondary to inflammation, though I have not seen this ophthalmoscopic aspect myself in secondary detachments of this nature.

The purpose of this paper is only to show that subretinal precipitates may be present in large secondary detachments in cases of melanoblastoma.

Summary

In detachments secondary to melanoblastoma, subretinal "precipitates" may occur, consisting of clusters of (sub) necrotic pigment epithelium cells.

Wilhelmina-Gasthuis.

METASTATIC CARCINOMA OF THE IRIS*

Leo L. Mayer, M.D., and Jamil G. Nassar, M.D.
Jackson, Mississippi

Although metastatic carcinoma of the whole uveal tract is not infrequent (Finkelman and Mayer,[5] in 1933, found 130 cases in the literature and many more have been added since), metastatic carcinoma is rare and, since in the present case we have been able to confirm the diagnosis of metastatic bronchogenic carcinoma limited to the iris, we are adding it to those already reported (Sanders,[1] Asbury and Vail,[2] Proctor and Verhoeff,[3] Reese[4]).

Case report

E. G., a 63-year-old Negro, was admitted to the Eye Service of the Veterans Hospital in Jackson, Mississippi, on June 14, 1957. He was complaining of mild ocular discomfort, O.D., of one month's duration.

His old records showed that he was admitted previously in March, 1955, because of shortness of breath and a mild chronic productive cough. X-ray studies of chest revealed extensive cystic emphysematous changes in both upper lungs (fig. 1). The heart was normal. Electrocardiogram was normal.

It was concluded that his dyspnea was due to pulmonary insufficiency.

Since then, he has been having some productive cough. He has lost 30 pounds during the last six months. No history of hemoptysis or pleuritic pain was given.

On physical examination, he was not in distress. The right eye showed multiple lobular lesions, the largest being near pupillary margin. It was oval in shape, measuring 4.0 by 3.0 mm. The lesions were grayish in appearance and vascularized. The pupillary border was irregular (fig. 2). The lens was clear. The fundus was normal, except for mild arteriosclerotic changes of vessels. Vision was 20/30. Tension was 17 mm. Hg (Schiøtz).

The left eye was normal in appearance. Vision was 20/20.

A chest film revealed the same bullous emphysema which was present during his previous admission. In addition, a large central area of infiltration in left midlung field was seen. No cavitation was

* From the Departments of Ophthalmology, Veterans Administration Center, and the University of Mississippi School of Medicine.

Fig. 1 (Mayer and Nassar). X-ray studies of the chest in March, 1955, revealed extensive cystic emphysematous changes in both upper lungs.

present. The hilar nodes and the left paratracheal nodes were enlarged (fig. 3).

Bronchoscopy showed narrowing of the left main bronchus due to external compression (fig. 4). Bronchial aspirates were negative for malignant cells and acid-fast bacillus.

Bronchographic studies of the left lung showed the left main stem bronchus to be depressed downward, apparently by the markedly emphysematous left upper lobe. There appeared to be slight narrowing of the left main stem bronchus before its bifurcation into the upper and lower lobe bronchi, apparently by external compression. The proximal portions of the major bronchi to the left upper and lower lobes were visualized and these did not appear to be abnormal.

Branch bronchi to the left upper lobe were all fairly well visualized and did not show any significant abnormality. Only the secondary branches and terminal branches leading to the medial basal segment of the left lower lobe were filled, and these too did not appear abnormal. There was apparently no filling of the branch bronchi leading to the posterior basal branches and the superior basal branches of the left lower lobe, the latter area being the region of the infiltration observed on earlier study.

Ten days following admission, the tension in the right eye rose to 36 mm. Hg and the patient complained of ocular pain and headache. A biopsy was performed (fig. 5). The pathologist thought that the tumor could be a melanoma. Another pathologist had the same doubt in his mind. AFIP Accession No. 811590 reported a neoplasm metastatic from the lung. A felt scalene lymph node biopsy revealed the presence of the same neoplastic cells (fig. 6).

Within six weeks, the tumor in the eye grew to fill the anterior chamber (fig. 7). Also, it extended through the limbal incision which was performed for the biopsy iridectomy. The eye was blind.

The patient started complaining of pain in the chest and he became hoarse. Indirect laryngoscopy showed paralysis of left true vocal cord.

On August 9, 1957, the right eye was enucleated and sent to the Armed Forces Institute of Pathology, Washington, D.C. The gross findings read:

"The specimen consists of a soft right eye measuring 24 by 23.5 mm. with the optic nerve cut flush with the sclera. There is a soft, seminecrotic, pink-to-gray tumor mass along the limbus from the 6- to 10-o'clock positions. The area involved is 12 by 9.0 mm. The corneal epithelium appears speckled with melanin pigment radiating inward from the limbus.

"The anterior chamber is filled with a gray-white tumor mass that hides the iris and pupil. A small blood clot is interposed between the tumor and the cornea. The eye transilluminates faintly through the

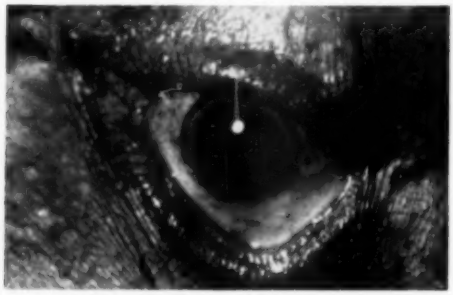

Fig. 2 (Mayer and Nassar). The right eye showed, on June 14, 1957, multiple lobular lesions, the largest being near the pupillary margin.

FIG. 3 (Mayer and Nassar). A chest film in June, 1957, revealed a large central area of infiltration in the left midlung field.

posterior segment, but not through the anterior segment. The section is oblique.

"The iris is greatly thickened by lobules of gray-white tumor tissue measuring from less than 1.2 mm. to up to 3.0 mm. in diameter. Many of these have semitranslucent (?) mucoid centers and some minute foci of hemorrhage. The anterior chamber is obliterated by the adherent iris. The lens is firmly bound to the iris.

"No tumor is identified in the ciliary body or choroid. There is a small area of serous separation of the retina posteriorly about the cupped optic disc. Thickened retinal folds are present in this area."

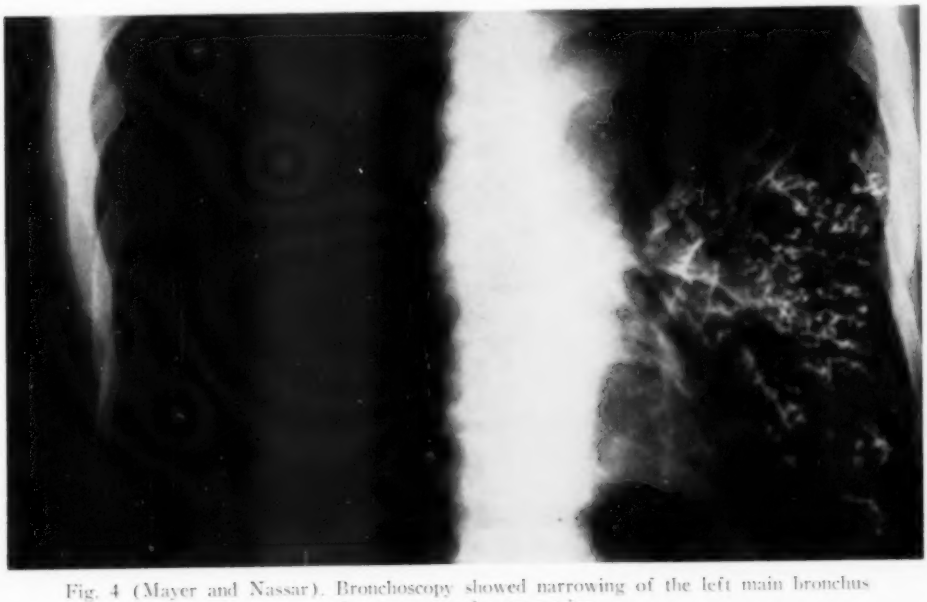

Fig. 4 (Mayer and Nassar). Bronchoscopy showed narrowing of the left main bronchus due to external compression.

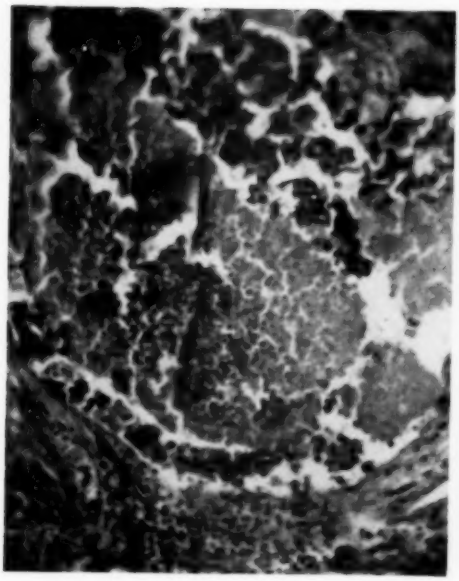

Fig. 5 (Mayer and Nassar). Biopsy from the right eye.

Fig. 7 (Mayer and Nassar). Within six weeks the tumor of the eye filled the anterior chamber.

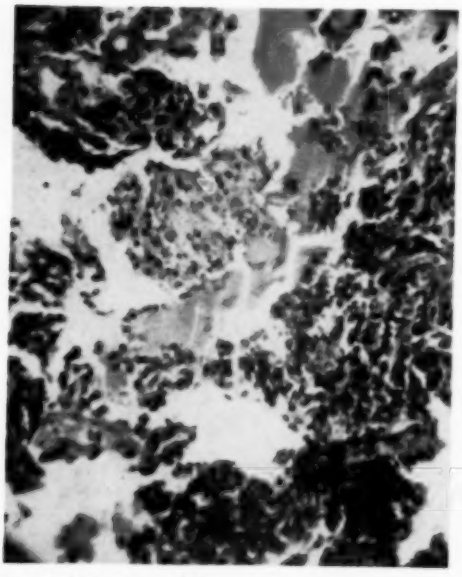

Fig. 6 (Mayer and Nassar). A left scalene lymph node biopsy revealed the presence of neoplastic cells.

Fig. 8 (Mayer and Nassar). Metastatic carcinoma of the iris with extension through the iridectomy wound of the cornea; mature cataract; secondary glaucoma.

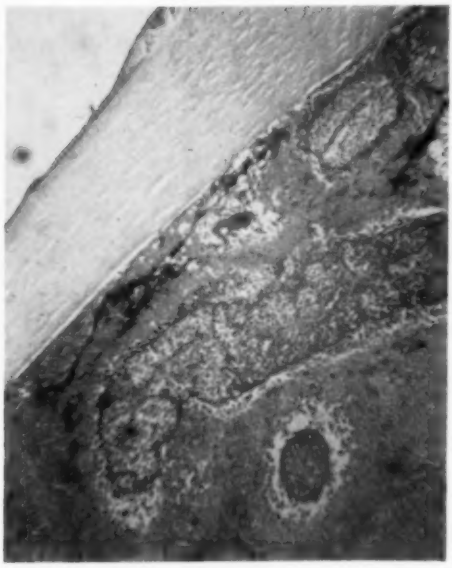

Fig. 9 (Mayer and Nassar). A section from the enucleated eye.

The microscopic findings read:

"The corneal epithelium shows mild edema of the basal layer and these cells also show a moderate degree of melanin formation. The limbal tissues are undermined by a vascular pannus that is lightly infiltrated by chronic inflammatory cells. On one side there is also a nodule of neoplastic tissue which has apparently herniated through a surgical wound of the peripheral cornea for this nodule is continuous with a mass of largely necrotic tumor tissue filling the anterior chamber.

"There is widespread necrosis of the iris which in many areas also contains islands of neoplastic tissue. More of the tumor tissue present within the iris and within the anterior chamber is completely necrotic than is viable. The viable tissue, however, presents as a pattern of growth around prominent dilated central vascular stalks.

"The tumor cells appear to be predominantly large, polygonal to columnar elements having an abundance of clear cytoplasm and large round to ovoid moderately chromatic nuclei.

"Frequently there is palisading of nuclei of the cell layer immediately adjacent to the vascular stalks which takes on the pattern of pseudostratified columnar epithelium. Mitotic figures are extremely numerous. There is no evidence of melanin formation by the tumor cells.

"The remainder of the uveal tract is not involved by this tumor. The lens shows widespread degeneration of the cortex and nucleus. The retina shows mild atrophy of its inner layers and diffuse edema involving all layers. There is early glaucomatous cupping of the optic disc.

"Diagnosis: Metastatic carcinoma of iris with extension through iridectomy wound of cornea; mature cataract; secondary glaucoma" (figs. 8 and 9).

The patient is still in the hospital and we may be able to procure an autopsy in the future.

Discussion

The incidence of metastatic carcinoma of the iris is very low. One of its characteristics is its insidious early course. With time, two factors cause the development of symptoms. One is the secondary glaucoma, the other is the necrosis which affects the tumor and the iris. Clinically, tuberculosis, syphilis, sarcoidosis, benign tumor or malignant neoplasms of the iris, especially melanoma, enter in the differential diagnosis. The final word is that of the pathologist. In our case, two pathologists, looking at the iris biopsy slides, thought that we could be dealing with a melanoma. The following points were brought up by the Armed Forces Institute of Pathology reporter in favor of his diagnosis in ruling out a melanoma.

"1. Cytologically and histologically it resembles an undifferentiated bronchogenic carcinoma, while it does not suggest a primary iris melanoma. In a few places there is a suggestion of differentiation toward mucus-producing cells.

"2. Necrosis occurs frequently in metastatic tumors of the iris while this is an extremely uncommon feature of iris melanomas.

"3. Bronchogenic carcinoma is the primary extraocular neoplasm which metastasizes most frequently to the eye in moles.

"4. Intraocular melanomas are seen but rarely in the Negro."

In our case the metastatic lesion was contralateral to the site of the primary neoplasm. In the literature homolaterality is the rule; there is no justification for this since the metastasis is blood born.

SUMMARY

The literature was reviewed and the eighth case of metastatic carcinoma limited to the iris is reported.

The site of the primary lesion was localized to the lungs by radiographic studies and scalene lymph node biopsy.

The histologic findings of the metastatic lesion are described and its limitation to the iris is shown.

A general discussion on the incidence, symptomatology, origin, and differential diagnosis is given.

Veterans Administration Center.

We wish to thank the Armed Forces Institute of Pathology for their co-operation, and the Photography Department at this Veterans Hospital, headed by Mr. William Fox.

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CHEMICALLY CAUSED STRIATE KERATITIS*

DUE TO THE INTRODUCTION OF A WETTING AGENT INTO THE ANTERIOR CHAMBER DURING CATARACT SURGERY

N. E. CHRISTY, M.D.

Taxila Jn., Pakistan

In a series of cataract extractions previously reported from this hospital (Am. J. Ophth., **44**:649 [Nov.] 1957), a disturbingly high incidence of postoperative striate keratitis was noted. In an effort to discover and remove the cause of this keratitis, the routines and techniques employed were reviewed. It was noted that the incidence was higher in the intracapsular extractions than in the capsulotomies, suggesting that the introduction of one more instrument into the anterior chamber might have had some effect on the incidence of the keratitis.

In the technique employed in the 1,000 cases reported previously the anterior lens capsule was intentionally incised with the von Graefe knife in the 12- to 6-o'clock meridian at the time of the initial incision when an intentional capsulotomy was to be done, so that in the capsulotomy technique the only instruments entering the anterior chamber were the knife and the iris forceps. In the intracapsular technique either the capsule forceps or an erisophake was introduced into the anterior chamber in addition to the knife and iris forceps.

During the period in which the 1,000 cases reported in the previous article were performed it was our standard technique to disinfect cutting instruments and capsule forceps by soaking them in a 1:1,000 aqueous solution of Zephiran (alkylbenzyldimethyl ammonium chloride) containing sodium nitrite, four parts per thousand. In the latter part of the series a similar British drug, Cetavlon (Cetrimide B.P.), a quaternary ammonium compound, in a one-percent aqueous solution, also containing sodium nitrite, was used for disinfecting the cutting instruments and capsule forceps. This solution was shaken from the instruments before they were introduced into the operative field —in the case of the von Graefe knives and capsule forceps into the anterior chamber.

In view of the fact that wetting agents are known to cause damage to the corneal

* From the Taxila Hospital, American United Presbyterian Mission.

TABLE 1

INCIDENCE OF STRIATE KERATITIS IN TWO REPORTED SERIES OF CATARACT EXTRACTIONS

	1955–56 Series		1957 Series	
All Cases				
	Number	Percent	Number	Percent
Number of Cases	1,000		1,000	
Keratitis +	317	31.7	142	14.2
++	79	7.9	40	4.0
+++	9	0.9	11	1.1
Total	405	40.5	193	19.3
Capsulotomies				
Number of Cases	365		290	
Keratitis +	95	26.0	44	15.2
++	22	6.0	12	4.1
+++	5	1.3	6	2.1
Total	122	33.3	62	21.4
Intracapsular Extractions				
Number of Cases	610		672	
Keratitis +	218	35.8	90	13.7
++	55	9.0	17	2.5
+++	4	0.6	6	0.9
Total	277	45.4	113	17.1

endothelium, it was thought that the small amount of solution remaining on the knives and capsule forceps might be a factor in the high incidence of striate keratitis noted. Consequently, in the cases which form the basis of this report, instruments which had been soaked in Zephiran or Cetavlon were thoroughly rinsed in sterile water and then allowed to soak in sterile water for five to 10 minutes before they were introduced into the eye. Techniques were not significantly changed in any other way during this series; the patients were of the same type as described in the previous series; the distribution of cataract types was almost identical; and the surgeon was the same.

The present report is based on results of 1,000 cataract operations performed at the American Mission Hospital, Taxila, Pakistan, during the spring eye season, February to April, 1957.

Table 1 compares the incidence of striate keratitis in the series previously reported (performed in 1955-56) with the incidence of postoperative keratitis in the present series performed in 1957. In the cases in which capsulotomy was performed, the incidence dropped from 33.3 to 21.4 percent. In the cases in which intracapsular extraction was performed, the incidence dropped from 45.4 to 17.1 percent. As in the previous series the striate keratitis in almost every case cleared entirely within six to eight days but, in a small number of the more severe cases, some corneal opacity persisted.

It becomes apparent that even the small amount of wetting agent which clings to knives or other instruments which have been soaked in such agents can be the cause of a considerable amount of postoperative keratitis when these instruments are introduced into the anterior chamber and that

great care should be used in removing all traces of such agents from instruments before they are used in the eye. It should be noted that the manufacturers of Cetavlon, The Imperial Chemical Industries, Limited (London), recommend in their literature that instruments immersed in Cetavlon be rinsed "thoroughly with sterile water to remove all traces of Cetavlon" before use.

I am now trying to find the cause of the remaining postoperative keratitis and, since a 0.1-percent aqueous solution of Cetavlon is used in the preoperative irrigation of the conjunctival sac this is being investigated as a possible cause.

Summary

Data are presented from two series of cataract extractions of 1,000 cases each illustrating and re-emphasizing the fact that the introduction into the anterior chamber of even minute amounts of detergents or wetting agents, such as may be introduced on instruments which have been soaked in such agents, may be the cause of striate keratitis following intraocular surgery.

In the series reported a marked reduction in the incidence of postoperative striate keratitis was effected by exercising greater care in the removal of wetting agents from all instruments before they were introduced into the eye.

American Mission Hospital.

ANOPHTHALMOS*

Roland I. Pritikin, M.D.

Rockford, Illinois

This case of anophthalmos, the name applied to the absence of an eyeball, was seen in an infant who was born with the complete absence of both eyes. In addition, this child had some fusion of upper and lower lids (ankyloblepharon) except at the center where some portion of the lid margin was present and a few cilia were seen. There were also a few filamentous adhesions between the upper and lower lids (ankyloblepharon filiforme adnatum).

Fig. 1 (Pritikin). Appearance of child.

Fig. 2 (Pritikin). Sutures in place.

Case report

Baby J. K., a white girl, was born at term on May 31, 1957. Birth weight was 8 lb., 15 oz. No consanguinity was involved. Both parents are healthy. The mother was not ill during the entire period of gestation. There was no history or indication of intrauterine infection. Two brothers, aged seven and three years, are living and well. The patient was first examined by me when she was six days of age (fig. 1).

On July 1, 1957, the following operation was performed on the left eye under general anesthesia using rectal pentothal. The upper and lower lids were separated by incision. The socket was explored. No vestige of an eye was found. Three doubled-armed sutures were placed through the skin and conjunctiva above and below the incision.

* From the Rockford Memorial Hospital.

Fig. 3 (Pritikin). Section from the right eye.

This was a plastic operation for the purpose of creating lid margins by sewing the upper and lower lids to their respective conjunctival margins. The sutures were tied on beads placed at the lid margins and the long suture ends were fastened above to the forehead and below to the cheek by strips of adhesive tape. This kept the new lid margins apart. A prosthesis molded from dental compound was placed in the newly formed socket. A similar operation was then performed on the right eye, except that one suture was used on the upper lid and one on the lower lid.

Ten days later the sutures were removed (fig. 2) but the prostheses were permitted to remain. In a few weeks plastic prostheses were placed in the sockets.

To date no other congenital anomalies have been found in this infant. This leads one to believe that this is the type of anophthalmos in which an optical vesicle had formed and later degenerated (figs. 3, 4, and 5).

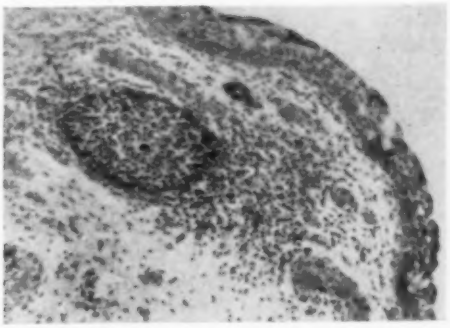

Fig. 4 (Pritkin). Section from left eye.

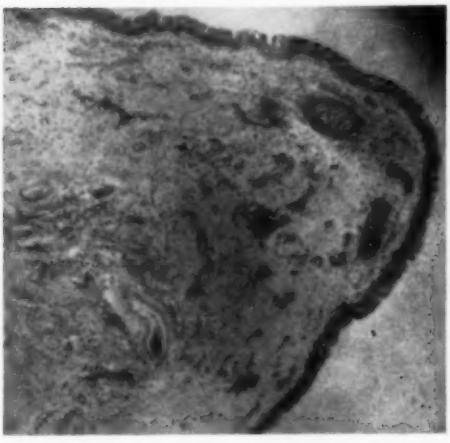

Fig. 5 (Pritikin). Section from left eye.

Anophthalmos is so rare that the methodology of medical genetics does not apply. It is possible that it may be due to failure of neural ectoderm to form an eyeball. The number of recorded cases during the past century is less than 100.

Talcott Building.

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OPHTHALMIC RESEARCH

EDITED BY FRANK W. NEWELL, M.D.

Abstracts of papers to be presented at the 27th annual meeting of the Association for Research in Ophthalmology, Terrace Room, Fairmont Hotel, San Francisco, California, June 23 through 27, 1958

MONDAY MORNING, JUNE 23

Heterologous immunological studies with lens. Patricia L. FitzGerald, B.A., and Seymour P. Halbert, M.D., Department of Ophthalmology Research, College of Physicians and Surgeons, Columbia University, New York.

Earlier studies have shown that rabbits can be readily immunized with homologous rabbit lens with the aid of Freund's adjuvant as a vehicle. Such sera have revealed at least five distinct antigen-antibody systems with agar precipitin techniques. Cross reactions of these sera with lenses from a wide variety of vertebrates were shown to be due to antigenic similarity of from one to all five of the components visualized.

Heterologous antisera have now been prepared in rabbits to lenses of several other species; human cataract, fish (menhaden), frog (rana pipiens) and squid. These antisera showed from at least four to seven antigen-antibody systems with their immunizing lens. The number of cross reactions of the vertebrate lens antisera with lenses of other species essentially agree with the cross reactions previously found with homologous rabbit antilens sera.

The antisquid lens antisera failed to show any cross reactions with any of the vertebrate lenses tested and revealed up to four antigens with the squid lens. All of the vertebrate antilens sera failed to show any precipitin bands with the squid lens. Absorption of squid lens antisera with vertebrate lens failed to affect the precipitin bands of this system. Alternatively, absorption of antivertebrate lens sera with squid lens failed to affect their precipitin bands. These findings support chemically the possibility that evolutionary development of lens proteins may have taken place along two different lines.

Radioelectrophoretic patterns of aqueous and plasma after intravenous injection of I^{131}-labelled insulin into normal and diabetic rabbits. Kenneth M. Giles, B.S., and John E. Harris, M.D., University of Oregon Medical School, Portland.

Previous studies in this laboratory have shown that following the injection of I^{131}-labelled insulin, a radioactive protein similar to insulin enters the aqueous humor in small amounts.

The present study was undertaken, first, to define more exactly this protein as insulin and, second, to determine the effect of alloxan diabetes and high glucose levels in nondiabetic animals on the movement of the protein.

Aqueous and plasma samples were drawn at selected time intervals after intravenous injection of I^{131}-labelled insulin. Paper radioelectrophoretograms were made by subjecting the samples to paper electrophoresis and subsequently counting one-mm. strips at consecutive distances from the origin. In appropriate instances carrier substance, insulin or some other protein was added. The results are presented and discussed. It seems likely that the insulin enters the aqueous in relatively small quantities under the conditions studied.

An electromyographic study of asymmetric convergence. Edward Tamler, M.D., Arthur Jampolsky, M.D., and Elwyn Marg, Ph.D., Division of Ophthalmology, Stanford University School of Medicine, San Francisco.

Several reports have come out in recent years regarding innervation to the stationary eye in asymmetric convergence and the validity of Hering's law during such convergence. Asymmetric convergence has been studied electromyographically by simultaneously recording the electrical activity of all four horizontal rectus muscles. The stationary eye remains still because of an equal increase in innervation to its medial and lateral rectus muscles, as expected from Hering's law.

The electromyographic pattern of saccadic eye movements. James E. Miller, M.D., Washington University School of Medicine, Saint Louis.

By the use of two coaxial electrodes made with 25 micron wires, it is possible to obtain the pattern of single motor units by electromyography. These may be followed in volitional eye movements. In addition the use of a data tape recorder permits a permanent record of mass response which may be integrated during various phases of eye movements.

It has been found that a sudden eye movement is initiated by a large mobilization of motor units which quickly diminishes. This recruitment is somewhat related to the amplitude of the movement.

Single motor units appear to discharge at a fairly constant rate while the eye is maintained in a fixed position. Movement increases the rate of firing and utilizes additional motor units.

11-Cis vitamin A in the prevention of retinal rod degeneration: An animal study. Albert Chatzinoff, M.D., New Hyde Park, New York, Wil-

liam Oroshnik, Ph.D., and Nathan Millman, Ph.D., Ortho Research Foundation, Raretan, New Jersey, and Fred Rosen, Ph.D., Roswell Park, Buffalo, New York.

Dr. George Wald has shown that the all-trans form of vitamin A which is ingested in the human diet does not act in the formation of rhodopsin in the retinal rods. He showed that the neo-B isomer was the precursor of rhodopsin. During our study, one of us (W. O.) proved the neo-B isomer to be 11-cis vitamin A. Its value in the prevention of retinal rod degeneration was studied.

Newborn rats were depleted of all vitamin-A intake; somatic changes and marked retinal structure degeneration resulted. As is shown in our animal study (slides will be projected), repletion in similar newborn rats with more than minimal doses of all-trans vitamin A will prevent both the somatic and retinal changes. However, subminimal doses of all-trans vitamin A or even substitution of large doses of another isomer (11, 13 dicis) does not prevent either the somatic or retinal changes.

Our study showed that we can replete vitamin A deprived newborn rats with subminimal doses of 11-cis vitamin A (2, 4, and 8 units per week) and although somatic changes of vitamin-A deficiency occur, the retina in these animals is protected.

Our study suggests strongly that the 11-cis vitamin A is essential for the viability as well as the normal physiology of the retinal rods. It seems to be essential for other retinal layers as well.

In view of Dr. Norman Krinsky's study which showed the only tissue in the body containing the 11-cis isomer to be the retinal pigment epithelium, we believe that this isomer is specific for the metabolism of the retinal rods and perhaps the entire retinal structure.

We believe that 11-cis vitamin A is essential for the normal metabolism and ultimately the viability of the retinal rods. Thus, the ingested all-trans vitamin A must be isomerized somewhere in the body into a small amount of 11-cis vitamin A to be made available to the retinal pigment epithelium. This process undoubtedly occurs in normal individuals. In retinitis pigmentosa, we postulate an hereditary or constitutional metabolic inability to make this isomerization. A chronic deficiency of 11-cis vitamin A would lead eventually to retinal rod degeneration, and subsequently to pigment epithelium and retinal cone destruction. Substitution of the 11-cis isomer orally or parentally may prevent or reverse the progression of this disease. At present clinical studies are being pursued to evaluate the efficacy of 11-cis vitamin A in patients with retinitis pigmentosa.

Electrical activity of cells in the eye of Limulus. M. G. F. Fuortes, M.D. From the Ophthalmology Branch, National Institute of Neurological Diseases and Blindness, Bethesda, Maryland.

In a number of instances, the responses to illumination recorded by micropipettes inserted in cells of the Limulus eye consist of large sustained depolarization with superimposed large spikes. It is presumed that these responses originate in eccentric cells. Responses to light were compared to those evoked by currents through the impaling microelectrode, and interaction between light and current was analysed. Amplitude of depolarization and frequency of firing evoked by illumination are an approximately linear function of log of light intensity, a close linear relationship existing between frequency and depolarization. Frequency of firing is also a linear function of intensity of depolarizing currents. The potential change induced by a given light is increased in the cell if hyperpolarized and decreased if it is depolarized. Conversely, frequency of firing is decreased when the cell is hypopolarized and increased when it is depolarized.

Some properties of the cells in the Limulus eye may be derived from these data.

Conduction velocities in rabbit's optic nerve and their relationship to retinal spikes. Ragnar Granit, Nobel Institute for Neurophysiology, Karolinska Institutet, Stockholm, Sweden, and Elwin Marg, School of Optometry, University of California, Berkeley.

Increasing interest in optic-nerve conduction velocities in relation to color vision makes measurements of this kind of more than descriptive interest. The rabbit's optic nerve always shows three early waves, grouped together, and a small late one. Of the early ones those at average conduction velocities of 56 and 23 m./sec. have always been seen. The third early wave is mostly at 16 m./sec. When this has been absent, there has been seen a wave at 32 to 38 m./sec. The late response is much smaller and its wave front has a conduction velocity of 10 m./sec.

Recording by microelectrodes from the retinal ganglion cells shows a polymodal distribution of latencies relatively independent of intraretinal conduction velocities, because of the irregular demyelinization of the optic nerve fibers. There is a delayed, small spike with latencies of 11 to 14 m./sec. peak values which may correspond to the late wave in the optic nerve. Considerable variations in size of the optic-nerve ganglion cells are seen under the microscope.

The electrical activity of the eye during accommodation. Jerry H. Jacobson, M.D., Hunter H. Romaine, M.D., G. Peter Halberg, M.D., and George Stephens, M.D., New York Eye & Ear Infirmary, New York.

An attempt has been made to detect the change in electrical activity on the surface of the eyeball in humans during accommodation, and in cats during and immediately following electrical stimulation of the ciliary ganglion. It has been found that there is a very slow potential developed in both humans and animals best demonstrated with a D.C. amplifier. This potential has been found to be similar in time and conformation to that previously

reported for ciliary muscle activity by means of a mechanical transducer. Precautions were taken to ensure that there were no artefacts from eye motion or iris activity. Correlation was drawn between subjective accommodative function and electrical activity.

Changes in spontaneous and evoked potentials on the electroretinogram induced by drugs: Strychnine, atropine, LSD-25, mescaline. Julia T. Apter, M.D., Northwestern University, Department of Ophthalmology, Chicago.

Large spontaneous potentials may be found on the retinas of cats following the administration of each of four drugs: strychnine, (Therman, Granit), mescaline (Apter and Pfeiffer), LSD-25 (Apter and Pfeiffer), and atropine (Marshall). The present study is concerned with the effects these drugs have on the electroretinogram with respect to the following properties: (1) flicker fusion frequency, (2) thresholds, (3) optimal pick-up electrodes, (4) optimal placement of electrodes, and (5) the ability of the retina to show an evoked potential after enucleation of the eye.

1. Flicker fusion frequency is a property very difficult to assess except within wide limits. No definitive statement can be made as yet except that the four test drugs do not raise the threshold of flicker fusion tested by retinal potentials in cats.

2. The threshold for the minimal amount of light necessary to evoke a retinal potential is lowered by agents which lighten the depth of nembutal anesthesia. Since the test drugs reverse some aspects of nembutal anesthesia (Bradley and Key, Brody, Apter), threshold determinations do not add to a knowledge of a specific action they might have on the retina. They all do lower the threshold of the retina, however.

3. Electrodes made of silver introduce artefacts because this metal is photoelectrically active. Especially when the silver is chlorinated, results are unreliable, but even fresh silver is undependable. Platinum or steel wire, sutured to the sclera with silk so that a saline wick is transmitting retinal activity from under the sclera to the metal wire, are satisfactory. Calomel half-cell electrodes, though unwieldy, show the spontaneous ocular potentials best.

4. The design in which pick-up electrodes are placed on the sclera is critical. At least one of the two electrodes must be on sclera overlying the retina. If both electrodes are anterior to this area of sclera, the spontaneous potentials cannot be demonstrated. In addition, both electrodes must be on the surface of the eye. If a so-called indifferent electrode is placed off the surface of the eye, then too much ordinary spontaneous activity will mask the drug-induced potentials. More important, the two pick-up electrodes must be in a line perpendicular to the limbus to demonstrate optimally the spontaneous potentials. When the electrodes are in a line parallel to the limbus, only an occasional low-amplitude potential appears. It is notable that the three criteria for optimal demonstration of these drug-induced spontaneous potentials are also necessary for optimal demonstration of the evoked electroretinogram. Entirely different placement of electrodes is necessary for demonstration of ciliary nerve activity.

5. All four test drugs, but not metrazol, ephedrine or adrenaline, prolong the ability of the retina of an enucleated eye to show a photically evoked potential. When an eye is removed from the orbit of a nembutalized cat and tested with a photic flash every 15 seconds, an evoked potential is demonstrable for two to four minutes. This is a "survival time." Strychnine, LSD, or mescaline were given intraperitoneally, and atropine in the conjunctival sac, after testing the survival time of one eye. Sufficient time elapsed to allow the appearance of drug-induced spontaneous potentials on the remaining eye and then the second eye was removed from the orbit. Potentials could be evoked in these eyes for the following survival time: Strychnine, 30 to 40 minutes; mescaline, 15 to 24 minutes; LSD, eight to 15 minutes; atropine, seven to 15 minutes. Metrazol, adrenaline and ephedrine neither induce spontaneous potentials, nor increase survival time.

These drugs, acting as controls, suggest that several possible sources of ocular spontaneous potentials are not operating in the production of the potentials induced by LSD, mescaline, strychnine and atropine. These possible sources include corticofugal potentials, increased ocular blood supply, increased retinal oxygenation. Some other mechanism is probably responsible both for the spontaneous ocular potentials and for the prolonged retinal survival time. Data thus far indicates that a single mechanism is responsible for both phenomena.

Monday afternoon, June 23

Mechanism of corneal destruction by Pseudomonas proteases. Earl Fisher, Jr., Ph.D., and James H. Allen, M.D., New Orleans.

Previous work from this laboratory has indicated the importance of Pseudomonas proteolytic enzymes as a cause of certain corneal ulcers in experimental infections of rabbits (Fisher and Allen). Partially purified preparations of Pseudomonas proteolytic enzymes were found capable of producing severe corneal destruction and this action was correlated with the proteolytic activity of the fractions. Data will be presented concerning the mechanism of action of the proteolytic enzymes on corneal proteins. Corneal tissue of rabbits has been separated into two fractions, namely, soluble and insoluble portions. The action of Pseudomonas proteases on these corneal proteins will be discussed as well as the possible implications of their role in corneal infections. Data will also be presented concerning serologic studies and the possible use of an immune serum in the prevention of corneal destruction by Pseudomonas aeruginosa. The proteolytic enzyme studies to be reported may suggest

possible chemical agents which can be used therapeutically in the treatment of this infection.

Toxoplasmosis: The nature of virulence. Herbert E. Kaufman, M.D., Ophthalmology Branch, Jack S. Remington, and Leon Jacobs, Ph.D., Protozoal Diseases, National Institutes of Health, Bethesda.

Equal inocula of virulent and avirulent strains of Toxoplasma gondii, an intracellular parasite large enough to count, were obtained simultaneously from infected eggs, and were inoculated into tissue culture. At intervals after inoculation, the inoculum was washed off some cultures. The cultures were incubated for 25 to 26 hours—sufficient time for multiplication of the parasites but not for lysis of the cells. The tissues were then fixed and stained, permitting study of the rate of infection, the percentage of cells invaded, and the rate of multiplication of the organisms. Strains virulent for several species of animals invaded more cells, and multiplied faster than avirulent strains. The virulent RH strain, for example, invaded four to five times as many cells and multiplied about twice as fast as the less virulent 113 CE strain. Virulence, therefore, was correlated with both invasiveness and the rate of intracellular multiplication of the Toxoplasmas.

Studies on chronic toxoplasmosis: The relation of infective dose to residual infection and to the possibility of congenital transmission. Jack S. Remington, M.D., Leon Jacobs, Ph.D., and Herbert E. Kaufman, M.D., National Institutes of Health, Bethesda, Maryland.

The question of congenital transmission of toxoplasmosis from a chronically infected mother has been studied experimentally in rats by Hellbrugge, who obtained some infected offspring from rats inoculated four to eight weeks before pregnancy with large numbers of parasites. No positives were obtained from similar rats inoculated with smaller numbers. In order to check this observation, it was first necessary to ascertain if the parasite burden in chronic infections is related to the size of the initial infective dose. Series of rats were injected intracardially or intraperitoneally with graded inocula of RH strain Toxoplasma. After about six weeks, at which time the infections could be expected to be in the chronic stage, titrations were made of the infectivity of suspensions of brain and extraneural viscera of these rats. Preliminary results, in general, indicate that the number of residual parasitic foci (pseudocysts) in the brain was directly related to the original infective dose whether the inoculation was intracardially or intraperitoneally. Studies on offspring of chronically infected rats will also be presented.

In vitro observations on the behavior of conjunctival and corneal cells in relation to electrolytes. John Y. Harper, Jr., M.D. (introduced by C. S. Sykes, M.D.), Department of Ophthalmology and the Tissue Culture Laboratory, Department of Anatomy, University of Texas Medical Branch, Galveston. This study was aided by a grant from the National Society for the Prevention of Blindness.

Conjunctival and corneal explants were cultivated on cover slips in roller tubes for study with perfusion chamber techniques using phase contrast, time-lapse cinematography. The reactions of epithelium and endothelium to various electrolyte mixtures were compared to those obtained with normal saline. A short 16-mm. film and analyses of cinematographic records will be presented regarding the potential clinical value of commercially available electrolyte formulas as compared with results obtained with the use of Gey's balanced salt solution.

Antigen-antibody reaction in the rabbit cornea. C. E. Van Arnam, M.D., John Pratt-Johnson, M.D., A. E. Maumenee, M.D., and Frederick G. Germuth, Jr., M.D., The Johns Hopkins Hospital, Baltimore.

Previously it was hypothesized that the immediate type hypersensitivity reaction in the rabbit cornea was dependent upon the presence of blood vessels at the site of the reaction. The present study, using fluorescein tagged antigen, demonstrated that lesions apparently associated with antigen-antibody precipitation can occur in clear cornea separated from limbal vessels in both actively and passively immunized animals. This reaction occurred as a dense line of precipitation concentric with the limbus when antigen was injected intracorneally in the center of the cornea. Lysis of corneal stroma occurred at the line of precipitation accompanied by minimal cellular infiltration.

A line of precipitation was demonstrated in the central cornea duplicating the agar plate diffusion technique of Ouchterlony, by injecting both components of the system intracorneally with an intervening space of normal cornea. Lysis of corneal stroma occurred in this line.

Method, data and histopathologic findings are presented. The immunologic significance is noted.

The effects of various constituents of a synthetic medium on cell division in the epithelium of cultured lenses. Carl Wachtl, Ph.D., and V. Everett Kinsey, Ph.D., Kresge Eye Institute, Detroit.

The composition of a completely synthetic medium for the culture of the ocular lens will be presented. The adequacy of the medium was determined by comparing the total number of epithelial cells in division in the lens after culture with that in the uncultured contralateral lens.

The effect of the addition of various substances to the medium was investigated by observing changes in the mitotic activity and in the case of reducing compounds was correlated with the oxidation-reduction potential of the medium.

Some of the substances were found to be toxic, some essential, and some nonessential. The compounds tested included ascorbic acid, glutathione, cysteine, some nonessential amino acids, glutamine, six nucleosides, the co-enzyme triphosphopyridine nucleotide (TPN), the B-vitamin inositol, and kinetin.

The possible role of some of these compounds in the metabolism of the rabbit lens is discussed.

A tissue culture technique for growing corneal epithelium, stroma and endothelium separately. Frederick W. Stocker, M.D., A. Ewing, M.S., R. Georgiade, M.A., and N. Georgiade, M.D., Durham, North Carolina.

The authors have developed a technique by which the three layers of the cornea—epithelium, stroma and endothelium—may be grown in tissue culture separately. This seems to be necessary for the evaluation of the suitability of various methods of preservation of corneal tissues for grafting operations. The influence of various methods of preservation, such as freezing and storage in mineral oil, on the viability of the tissues was evaluated by this method.

Tuesday morning, June 24

Electron microscopy of the ciliary epithelium and zonula of the rabbit. George D. Pappas, Ph.D., and George K. Smelser, Ph.D., Departments of Anatomy and Ophthalmology, College of Physicians and Surgeons, Columbia University, New York. This investigation was supported by Research Grants No., B1202 and No. B492(C3) from the National Institute of Neurological Diseases and Blindness.

It has not been possible to demonstrate the precise nature of the attachment of the zonula fibers to the ciliary processes with the light microscope. With the electron microscope the fibers ordinarily seen are found to be bundles of fine fibrils (60-80 A in diameter) which come up to and condense into and form the internal limiting membrane (membrana limitans interna ciliaris) which covers the inner cell layer adjacent to the aqueous humor. Zonular material is not found within the cytoplasm of the cells, nor does it appear in the intercellular spaces. The internal limiting membrane is confined to the irregular free surfaces of the epithelium.

The free surface of the epithelial cells under the internal limiting membrane shows many deep folds and the boundaries between these cells are highly interdigitated. The outer epithelial layer is underlayed by a basement membrane, beneath which is found the connective tissue and blood vessels of the ciliary process. The cell boundaries of the inner and outer epithelial layers are very closely approximated and interdigitations can occasionally be seen.

Attempts were made to affect aqueous humor formation by embarrassing the drainage, or by systemic administration of agents which may affect the function of the ciliary epithelium or its vascular supply. Mineral oil, injected into the anterior chamber, produced the following changes: (1) the cytoplasm of the inner epithelial layer of cells became filled with small vacuoles, (2) the mitochondria were swollen, (3) very large vacuoles, causing a distension of the cytoplasm, were found in the outer epithelial cells lying on the connective tissue basement membrane. Limbal paracentesis and agents such as Diamox and Shigella toxin injected intravenously appear to produce somewhat similar changes.

The application of ultrasonic locating techniques to ophthalmology. Gilbert Baum, M.D., Port Chester, New York.

Recent experiments have proven the feasibility of visualizing the interior of the light opaque eye and the contents of the orbit using pulsed ultrasonic echo methods. Proper interpretation of such echograms necessitates a thorough comprehension of the acoustic parameters of these areas. The present paper describes the techniques use to determine the reflection and absorption of the ocular tissues.

The values and significance for specific tissues will be discussed. The lens of the eye possesses the highest coefficient of absorption of any tissue in the eye. This is probably related to its high protein content. From these values attempts at calculating the acoustic impedance and the theoretical coefficient of reflection from tissue interfaces were performed. These were then compared with experimentally obtained values.

Protein dynamics in the eye studied with labelled protein. David M. Maurice, Ph.D., Francis I. Proctor Foundation, University of California School of Medicine, San Francisco.

The movement of proteins across the blood-aqueous barrier, the blood-vitreous barrier and between the vitreous and aqueous humors has been studied.

The protein was labelled with a radioactive tag and injected intravenously. Its concentration in the serum and the intraocular fluids was measured after various periods of time. Alternatively, the labelled protein was injected into the vitreous body and its rate of transfer into the anterior chamber and its rate of disappearance from the eye determined.

From an analysis of these data it is possible to derive information about the mechanism of transfer of protein across the limiting barriers of the eye and of their rate of circulation in the intraocular fluids.

The influence of methylene blue and other dyes on the cation and water balance of the lens. John E. Harris, M.D., Louise Gruber, B.S., and Gertrude Hoskinson, B.A., University of Oregon Medical School, Portland.

Certain dyes effectively reduce the cation pump of the lens and cause a lenticular hydration in vitro. Methylene blue in low concentration is par-

ticularly effective. Present studies are concerned with the effect of these substances on cation and water balance of the lens in various concentrations. Mechanisms of action, which include alteration of the redox potential, uncoupling activity, and so forth, are considered. The site of the action is also discussed. It seems likely that these compounds act near the lens surface and support the previously enunciated view that the cation and water balance is largely determined by some structure or structures at or near the lens capsule.

Ocular changes induced by polysaccharides: II. Detection of hyaluronic acid sulfate after injection into ocular tissues. Ellen Talman, Ph.D., John E. Harris, M.D., and Louise Gruber, B.S., University of Oregon Medical School, Portland.

Previous reports from this laboratory have described pathologic changes occurring in the eye as a result of injecting an hyaluronic acid sulfate. In studying the mechanism of action of this material, it is desirable to determine its half-life in the eye. Therefore, some of its properties have been studied in an effort to devise a satisfactory method for detecting it.

Being an acid mucopolysaccharide, the material is strongly anionic. Paper electrophoretic studies, in barbital buffer at pH 8.6, show that the hyaluronic acid sulfate migrates roughly twice as fast as serum albumin and at about the same rate as heparin. Like other acid mucopolysaccharides, it stains metachromatically with toluidine blue and shifts the absorption maximum of the dye in the visible region to a shorter wavelength. Spectral changes of toluidine blue mixed with heparin are qualitatively similar. Both hyaluronic acid sulfate and heparin stain with Alcian blue but in this case, the absorption maximum of the dye in the visual range is shifted to a longer wave length upon mixing with the acid mucopolysaccharide. By using very concentrated solutions, it has been shown that a mixture of hyaluronic acid sulfate and Alcian blue forms a precipitate, suggesting that Alcian blue may serve as a fixative as well as a stain. The application of these findings to the detection of hyaluronic acid sulfate and related compounds in ocular structures will be discussed.

Changes in proteins and protein synthesis in lenses of rats during the development of tryptophan and radiation cataract. Zacharias Dische, M.D., Joy F. Elliott, B.S., and George R. Merriam, M.D., Department of Ophthalmology, College of Physicians and Surgeons, Columbia University, New York.

Experiments have been carried out to determine whether changes in the rate of synthesis of lens proteins of rats and in composition of the soluble protein fraction similar to those during the development of galactose cataract, appear in animals with cataracts induced by tryptophan deficiency and X-ray irradiation.

Animals five weeks old were used for the experiments. Tryptophan deficiency was induced by feeding a diet with acid hydrolyzed casein fortified by L-cystine as the only source of protein. Two sets of controls were used, of which one was fed the same diet as the experimental animals, except that 2.25/1,000 gm. tryptophan was added. The other was the standard pellet diet. Early cataractous changes were observed after 23 days. Animals were killed at various time intervals, starting 19 days after the beginning of the diet.

The experimental animals showed from the beginning a considerable loss in body weight which finally was stabilized at about two thirds of the weight at time zero. The wet weight of lenses, however, increased and was only 15 to 20 percent lower than that of controls. Synthesis of soluble proteins was inhibited from the beginning by 75 to 80 percent. Synthesis of albuminoid was not inhibited in the first three weeks, and later showed an inhibition of only 15 to 25 percent.

The soluble protein which precipitated after oxidation with $K_3Fe(CN)_6$ strongly increased in galactose-fed rats, decreased in tryptophan deficient rats. This suggests that the point of attack of the inhibitory effect on protein synthesis in tryptophan deficient rats differs from that in galactose rats.

In radiation experiments the right eyes of anesthetized rats were irradiated with 1,000 to 3,000 r at 18.75 cm. distance, 800 r/min. Early cataractous changes were observed about four weeks after 2,000 and 3,000 r irradiation, and animals were killed after that time interval or later. A significant inhibition of the synthesis of soluble lens proteins was observed after irradiation, but to a lesser degree than in the case of tryptophan and galactose cataract. The synthesis of albuminoid remains unchanged. The concentration of glutathione decreases by no more than 10 percent when first cataractous changes are observed with the slitlamp. The protein precipitable after oxidation is increased like in galactose cataract, but to a lesser degree. Determinations of changes in protein synthesis at shorter time intervals are under way. The possible significance of these findings for the pathogenesis of experimental cataracts will be discussed.

In vitro lens studies: III. Lens potential. Marguerite A. Constant, Ph.D., Washington University Medical School, Saint Louis.

The oxidation-reduction potential of lenses cultured in the presence of several acid or basic dyes and of lenses with cataracts produced in vivo were studied. The potential difference between a surrounding basal media and the outer two millimeters of cortex was measured using a fine platinum wire electrode and a standard calomel cell. The potential of lenses cultured in the presence of basic dyes, methylene blue, Thionin, toluidine blue, was more negative by approximately 100 mv. than that of contralateral lenses cultured in the basal media or of uncultured lenses. These dyes were found previously to cause considerable vacuolar changes in

vitro. Although the presence of 2,6-dichlorophenolindophenol had been found to result in severe cataractous changes in cultured lenses, the potential of these lenses was not different from that of the control cultured or uncultured lenses. Other acid dyes studied were not cataractogenic and did not alter the lens potential. Of the three agents (methylene blue, triphenyltetrazolium, or irradiation) previously found to cause similar cytopathologic changes in lens epithelium, only in the case of methylene blue was the lens potential significantly altered. The oxidation-reduction components of lens are being studied in relation to these changes.

Wednesday morning, June 25

Elevation of choroid by insertion of polyvinyl sponge: An experimental study. Martin S. Kazdan, M.D., and John W. Henderson, M.D., Mayo Clinic, Rochester, Minnesota.

In recent years there has been an increased interest in certain refinements that would improve the surgical techniques for detached retina. Most of these endeavors have been directed either toward a decrease in the circumference of the eyeball by some type of surgery on the sclera or by injecting some substance into the vitreous cavity to push the retina into a more nearly normal position. The basic aim of all these refinements was to approximate better the surfaces of the retina and choroid in the zone of the detachment. As a further step in this basic approach, the possibility of elevating the choroid by the insertion of some substance between the choroid and sclera was considered.

Such a substance would have to be well tolerated by the eye, should be relatively inert, and have such properties as to make it feasible for surgical manipulation and sterilization. The previous experience of one of us with the implantation of such a substance within the eyes of animals led us to choose polyvinyl sponge.

Polyvinyl sponge was inserted between the choroid and sclera of one eye of each of 27 dogs. The unoperated eye was used as a control. Seventeen of these eyes have been examined post mortem at the time of this report (six-month period of study).

The purposes of this experimental study were: (1) to develop a surgical technique for the insertion of polyvinyl sponge between the sclera and choroid; (2) to examine the gross and histologic effect on the eye of such implants, and to note how well elevation of the choroid persists over a period of time; and (3) to explore the practicality of various sites of implantation, and of different sizes and shapes of implant.

The most satisfactory surgical technique was as follows: Two parallel scratch incisions were made through the exposed sclera. An iris repositor with a hole drilled in the tip was passed from one incision to the other, so as to separate the choroid from the sclera. The strip of sponge was tied to the spatula, and pulled into place. The excess sponge was trimmed off, and the incisions sutured with silk.

In none of the eyes that have been examined histologically, nor in any of the eyes of the animals still under observation, have we observed any complication that would interfere with vision. There have not been any cases of extrusion of the implant. Elevation of the choroid and retina was achieved as planned, and this elevation has persisted practically undiminished for the six-month period of this study. Several animals are being kept for examination a year after implantation.

A histologic study was made of eyes that were removed at various intervals following the insertion of the polyvinyl sponge. In the first 24 hours there was invasion of the sponge by polymorphonuclear leukocytes. By the fifth day new vessels had entered the sponge, and the leukocytes were aligned along the sponge surfaces. On the 10th day the polymorphonuclear cells had virtually disappeared, and the sponge interstices were filled with fibrin, fibroblasts growing in from choroid and sclera, some mononuclear and some giant cells. In the third and fourth weeks giant cells were numerous, but by the eighth week they had disappeared. At six months, fibrous tissue filled the sponge, and the sponge material had become slightly thinned and fragmented.

The reaction of the ocular tissues to the imbedded sponge was minimal. The overlying choroid and retina were normal microscopically in most areas. There was inflammatory infiltration of the adjacent sclera in eyes examined soon after surgery, but in eyes examined later there was no significant damage to the sclera.

Most of the sponge strips were placed anterior to the equator of the globe, but some were placed posterior to it. Sponges as long as 23 mm. have been inserted. Width has ranged up to eight mm., and thickness up to eight mm.

On the basis of this experimental study the insertion of polyvinyl sponge into the suprachoroidal space of human eyes seemed feasible. In one individual with a detached retina such a surgical procedure has been performed.

Observations on accommodative convergence especially with regard to nonlinear relationships. T. G. Martens, M.D., and Kenneth N. Ogle, Ph.D., Mayo Clinic and Mayo Foundation, Rochester, Minnesota.

The convergence response to a change in the stimulus to accommodate can be measured in the simplest fashion by merely adding an ophthalmic spherical lens to a patient's correction and determining the resultant change in the phoria. This gives a very rough approximation of the accommodative convergence—accommodation (AC:A) ratio. By continuing this process, using both plus and minus lenses, a curve of the phoria can be obtained. This curve for most patients is found to

be a straight line and the AC: A ratio is accordingly described as a linear function. This is to say, the accommodative-convergence change was proportional to the change in the stimulus to accommodation, throughout the range of responses to ophthalmic spheres and within the range of the prism vergences.

The accommodative convergence—accommodation (AC:A) ratio (and the proximal convergence ratios where possible) were determined in 125 patients at the clinic by the fixation disparity technique. In the majority of these cases the relationship between accommodative convergence and accommodation was linear. In a certain percentage of the cases, however, the relationship was found to be nonlinear, that is, the constant proportionality did not hold throughout the range of response. This paper reports more specifically on the nature of these cases where nonlinear results were found, due regard being given to the findings of the clinical ophthalmic examination. The effect of this nonlinearity on the calculation of the proximal convergence ratios is also considered.

The effect of topical application of certain so-called autonomic drugs on human visual flicker discrimination. Mathew Alpern, Ph.D., and Robert S. Jampel, M.D., Department of Ophthalmology and Vision Research Laboratory, University of Michigan, Ann Arbor.

Recent reports suggest that sympatheticomimetic and parasympatheticolytic drugs produce an increase, while sympatheticolytic and parasympatheticomimetic drugs produce a decrease, in critical flicker frequency when they are instilled into the conjunctival sac. The present experiments were designed to determine if these effects were related to functional changes in the retina as previous experimenters commonly believed.

Apparatus was designed to allow a rigorous control of such important variables as pupil size, adaptation and surround. Measurements were made on two well-trained observers.

In identical concentrations as those used by Fleming, homatropine (parasympatheticolytic) regitin (sympatheticolytic) and epinephrine (sympatheticomimetic) had no measurable effect on flicker thresholds when these variables were controlled. Previous results with these drugs can be attributed to failure to control fluctuations in pupil size or adaptation. One drop one-percent eserine, however, produced a significant ($P < 0.05$) decrease in critical flicker frequency for both observers. The same result occurs over a wide range (about four log units) in intensity of the flickering light. In concurrent measurements in time of the flicker threshold (using the nontreated eye as control), the size of the pupil and the state of accommodation will be described. With eserine the decrease in critical flicker frequency begins about five minutes after instillation of the drug; reaches its maximum effect (a decrease of about eight cycles/sec.) in 15 to 30 minutes; and gradually returns to normal in about one hour. The role of spasm of the ciliary muscle is evaluated in terms of (a) optical blur of the retina and (b) mechanical traction on the retina. Neither of these factors can be responsible for the effect.

Evidence supporting the position that the result is to be explained as a prolongation of a nicotinic effects of acetylcholine on retinal synapses will be reported. Parallels between the effect on the eye and pharmacologic experiments with similar drugs elsewhere in the nervous system will be pointed out.

Studies on the anatomy and pathology of the peripheral cornea. John A. Pratt-Johnson, F.R.C.S., Stanford University School of Medicine, Department of Ophthalmology, San Francisco.

The author has demonstrated an intermediate area between the sclera and cornea of human eyes with distinct histologic characteristics. The technique has included tangenitial sections of the limbus and staining with a variety of collagen stains. To date 188 sections of five human Eye-Bank eyes have been studied in detail.

Concurrently, the fatlike deposits of arcus senilis are being studied in human eyes, using tangential frozen sections and fat stains. This study will reveal whether the lucid interval between the arcus and the limbus coincides with the intermediate area between cornea and sclera.

Finally, the possible correlation of some of these findings with peripheral disease may be mentioned.

Distribution of acid mucopolysaccharides in the developing mouse eye: A study of pigmented and albino strains including the rodless C_3H mouse. Lorenz E. Zimmerman, M.D., and Ann B. Eastham, Central Laboratory for Pathologic Anatomy and Research, Veterans Administration, Armed Forces Institute of Pathology, Washington, D.C.

This study was initiated mainly as part of an effort to learn more about the hyaluronidase-resistant acid mucopolysaccharide which seemingly forms a sort of cement substance between the rods and cones and which seals them to the pigment epithelium. The pigment C_3H mouse was selected because there was readily available to us through the courtesy of Dr. Walter E. Hestan of the National Institutes of Health, a well-studied variant in which the outer retinal layers would degenerate at about the 14th day after birth. This corresponds to the period during which active retinal differentiation ordinarily takes place. Normal C_3H controls were also available as were Bogg's strain of Swiss albino mice. From each of these three groups, mice were killed at birth and each day for the first 21 days after birth. Selected stages of prenatal development were also studied.

Bouin-fixed mouse heads were embedded in paraffin and the eyes sectioned in situ through planes which included the optic nerves. Sections cut at seven microns were stained with hematoxylin-

eosin as well as for mucopolysaccharides (Alcian blue, colloidal iron, and periodic acid-Schiff methods). The effects of commercial bovine testicular hyaluronidase and Emmart's streptococcal hyaluronidase upon the staining characteristics of the developing ocular mucopolysaccharides were also investigated.

Although our interest initially was in the substance about the rods and cones and between them and the pigment epithelium, the opportunity was taken to make a more detailed analysis of the distribution and development of acid mucopolysaccharides in the cornea, sclera, and vitreous much as was done by Smelser and Ozanics in the New Zealand white rabbit with different methods.

Results of these studies will be presented in such a way that differences as well as similarities between the three groups of mice will be apparent. Comparisons will also be made to the distribution of acid mucopolysaccharides in the developing white rabbit eye.

Thursday morning, June 26

Incorporation of radioactive sulfate in the guinea pig eye: Influence of hormones and avitaminosis. An autoradiographic investigation. Godfred Larsen, M.D., Department of Ophthalmology Research College of Physicians and Surgeons, Columbia University, New York.

The incorporation of radioactive sulfate (S^{35}) was studied in the eyes of guinea pigs which were treated respectively with cortisone, thyroidectomy, thyroidectomy and thyrotrophin, thyroxine and scorbutic diet. The animals receiving 1.0 μc./gm. body weight carrier-free NA_2SO_4 intraperitoneally were killed 18 to 42 hours later. Whole eyes and pieces of eyes were fixed in 5-amino acridine hydrochloride dissolved in 50-percent alcohol for 24 hours, embedded in paraffin, cut into sections of 6.0 μ. Following deparaffinization the sections were studied according to the Pelc stripping film technique; the films were exposed for 30 to 43 days.

The uptake of S^{35} was found to be highest in the cornea and the sclera, lower in the uvea, while the retina showed no activity. Treatment with thyroidectomy, thyroidectomy plus thyrotrophin, and thyroxine revealed no variations in the uptake of radiosulfur. Cortisone seemed to decrease the uptake of S^{35} slightly, whereas C-avitaminosis gave a significant smaller response.

The mast cells which were difficult to find after the autoradiographs had been developed showed no accumulations of radiosulfur, neither in the eyes nor in the skin which was examined simultaneously in some of the animals.

Elaboration of the bicarbonate ion in intraocular fluids: VI. Kinetic studies with C^{14}-labelled $NaHCO_3$. Harry Green, Ph.D., John L. Sawyer, and Samuel I. Askovitz, M.D., Wills Eye Hospital, Philadelphia.

The rates of penetration and turnover of the bicarbonate ion in the aqueous humors of the rabbit eye, with and without the prior injection of Diamox, were studied with the use of intravenously injected C^{14}-labelled $NaHCO_3$. The results indicate that a considerable portion of the bicarbonate-ion concentration in the aqueous humor is a direct result of the active transfer from the blood as bicarbonate-ion and that Diamox apparently tends to suppress this rate of transfer. Furthermore, the rates of penetration and turnover of the isotope were markedly higher in the posterior chamber than in the anterior chamber. Estimates of the turnover rates and rates of penetration as well as of rates of transfer of bicarbonate ion by diffusion across the blood-aqueous barrier can be derived from the differential equations describing the modes of transfer of the tracer between the intraocular fluids and the blood plasma.

Outflow patterns of the cat eye. Frank J. Macri, Ph.D., Ophthalmology Branch, National Institutes of Health, Bethesda, Maryland.

The mean facility of outflow "C" in cat eyes was determined to be 0.28 cmm./min./mm. Hg. In the majority of eyes "C" was found to be constant throughout the intraocular pressure ranges studied (15 to 80 mm. Hg). In some experiments, however, "C" changed rather abruptly at different intraocular pressure levels. The most common pattern of this type was the change of "C" from a normal value at pressures usually above 35 mm. Hg to one which increased to much greater values at pressures below this level. A third type of outflow pattern could be produced at will by decreasing the systemic blood pressure of the animals, by the use of various pharamacologic agents. Under these conditions, it was observed that the outflow increased as the intraocular pressure fell and "C" became negative. At a critical pressure level the outflow curves reversed to the pattern obtained prior to the administration of the hypotensive agents. The mechanism of the latter type outflow pattern will be discussed.

The effects of beta radiation on the aqueous secretions in rabbits. Frank S. Schiff, M.D., College of Medical Evangelists, Los Angeles.

My research project is concerned with the effects of beta irradiation on the aqueous secretion in rabbits. Other authors have noted the transient reduction in intraocular pressure after about 3,000r of total eye X-ray exposure. My problem was to raise the dosage of irradiation to the point of permanent reduction without disturbing the deeper ocular structures. Strontium^{90} beta irradiation fulfills this purpose, although scleral necrosis and perforation too frequently occur when a given area of sclera is exposed to more than 60,000 rep of beta. It has been calculated that less than 10 percent of the irradiation reaches the ciliary processes. In the experiment, necrosis has been avoided by exposing the eye to a maximum of only 40,000 rep in any given area along the circumference. By irradiating

several areas, the total dosage to the ciliary body could be high and still prevent both scleral necrosis and incidentally a severe iridocylitis. According to my observations, a total of 80,000 rep to the ciliary body of the normal rabbit eye will give a lasting reduction of at least 10 mm. Hg with a Schiøtz tonometer. A lesser amount of irradiation (60,000 rep) will maintain hypotony for a period of more than two months.

Several interesting chance observations were made during the experiment. In the first week of irradiation, the facility of aqueous outflow increased considerably either from an effect on the outflow channels or more probably due to a decrease in scleral rigidity. It was also noted that hypotony began to a marked degree at the very end of the radiation exposure.

When 50,000 rep of beta rays were given across the limbus of the rabbit, a necrosis iridectomy could be produced without perforation of the sclera. Naturally, this is only an initial experiment, for much more work needs to be done in this type of study, especially in the use of other types of irradiation which could have more of a pinpointing destructive effect on the ciliary process. Histologic studies of the irradiated eyes will be made.

Pressure-volume relationship in the intact human eye. Robert A. Moses, M.D. and Ahti Tarkkanen, M.D., Washington University School of Medicine, Saint Louis.

The Goldmann applanation tonometer permits measurement of the force required to produce flattening of an area of cornea of known diameter. From force and area, intraocular pressure during tonometry (P_t) may be computed. From the radius of the flattened corneal surface and the radius of curvature of the cornea obtained by means of a keratometer, the volume of aqueous displaced during corneal flattening may be estimated. Thus, if measurements are made of the force required to produce applanations of different diameters, a pressure-volume (elasticity) curve may be plotted for an intact human eye.

Several prisms of the Goldmann type but with different applanation diameters were constructed and measurements have been made in several cases. The ocular elasticity curves for applanation tonometry have been plotted from these data.

The hydrophilic property of the orbital connective tissue of normal and exophthalmic animals. George K. Smelser, Ph.D., and Victoria Ozanics, M.S., Departments of Ophthalmology and Anatomy, Columbia University, College of Physicians and Surgeons, New York. This work was supported by a Fight-for-Sight Award of the National Council to Combat Blindness, Inc., New York.

One hypothesis of the cause of edema of the orbital tissue in exophthalmos suggests that there is an increase of some hydrophilic component, possibly hyaluronic acid, of the connective tissue ground substance. To test this hypothesis the hydrophilia of the orbital connective tissue (fat) of thyroidectomized guinea pigs made exophthalmic by injections of anterior pituitary extracts plus cortisone, and of nonexophthalmic control animals (thyroidectomized and normal) was investigated. The tissues were frozen immediately on removal from the animal, dried by lyophilization, weighed and exposed in a closed chamber saturated with water vapor. The amount of water taken up by the tissues of the control and exophthalmic animals was determined by weighing. Significant difference in the hydrophilia of the orbital tissue of exophthalmic and nonexophthalmic animals was found.

Hyaluronic acid was strongly hydrophilic under the conditions of these experiments. Similar tests were also made on tissues known to vary in their mucopolysaccharide and water content, namely the hypertrophied combs of chicks treated with testosterone and compared with normal nonhypertrophied chick combs. Such experiments showed that the hypertrophied chick comb was more hydrophilic than the normal. These results establish confidence in the experimental method and suggest that the hypertrophy and edema of the orbital connective tissue in exophthalmos are due, at least in part, to an increase in its hydrophilic property.

SOCIETY PROCEEDINGS

Edited by DONALD J. LYLE, M.D.

MEMPHIS EYE, EAR, NOSE, AND THROAT SOCIETY

THROMBOSIS OF THE RETINAL ARTERY

DR. ALICE R. DEUTSCH presented Mr. A. O., a 60-year-old tailor, who was seen at the office on February 9, 1955. He gave the history of periods of blurred vision of the left eye for the last two days. About 30 minutes before rusning to the office he had a similar episode; he closed his eyes for several minutes, as he had during the previous attacks; but, when he opened his eyes again, he noticed that he could not see at all with the left eye.

On examination the right eye was found to be normal externally; some opacities were visible in the posterior cortex of the lens; the disc had a normal color and the margins were sharp; the fundus picture was classified as arteriolosclerosis Grade II to III. His corrected vision equalled 20/30, J3.

The left eye showed marginal corneal opacities. The pupil was dilated and did not react either directly or consensually to light. The retina showed a diffuse glassy edema and the disc was pale and not very sharply outlined. The arteries were narrow and difficult to see; the viens were very dark but did not show any breaking up of the blood stream. His vision was light perception only in the temporal field. Tension equalled: O.D., 17.3 mm. Hg, O.S., 22.1 mm. Hg (Schiøtz). His blood pressure was 210/120 mm. Hg.

Mr. O. gave the information that he was supposed to take some medicine for his blood pressure but that he did not take it regularly. His family physician could not be reached by telephone for consultation. Because of the presence of the severe vascular fundus changes, the diagnosis of thrombosis of the retinal artery was made in preference to an embolism. It was also thought essential to relieve a possible simultaneous vascular spasm before irrevocable damage to the retina should take place.

Nicotinic acid (100 mg.) was injected slowly, intravenously. In spite of the fact that Mr. O. got very flushed and the blood pressure dropped from 210/120 to 180/110, no change could be seen in the retina of either eye. It was decided at this time to give Mr. O. a retrobulbar injection of three cc. of two-percent procaine and at the same time give 0.12 gr. papaverine hydrochloride intravenously by slow injection, while the blood pressure was checked every minute. There was no remarkable drop in blood pressure.

When the patch was removed from the left eye the patient at once noticed that he could see again. The pupil reacted sluggishly to light and was much narrower than before but still was more dilated than in the other eye. The retinal edema, however, was unchanged but the upper branches of the retinal artery were visible.

Later on Mr. O. was admitted to the hospital and, after consultation with his family physician was put on Serpasil (0.10 mg.), Apresoline (25 mg.) three times daily, Nitranitol (32 mg. three times daily), and Dicumarol (200 mg. the first day and 100 mg. the second day). The dosage of the antihypertensive, vasodilator, and anticoagulant drugs was adjusted from day to day.

The fundus picture showed remarkable changes. On the evening of the first hospital day the edema in the upper half of the fundus had subsided. The edema in the lower half of the fundus became more pronounced and appeared milky the next day. After one week the nasal inferior fundus periphery was clearer, while the temporal inferior fundus showed a peculiar striated appearance with many flame-shaped hemorrhages; the inferior temporal artery had a

clublike dilatation on the corresponding disc margin and ended in a grayish-white oblong streak which became abruptly thinner until it tapered off toward the periphery.

Mr. O. stayed in the hospital for two weeks. He was kept under Serpasil (0.1 mg. three times daily) and Dicumarol (50 mg.) by his family physician. The Dicumarol was discontinued after six weeks.

He was seen again on May 11, 1955. At this time the right eye was unchanged. The disc of the left eye was dimly outlined and paler than the right, especially in the lower half. The inferior temporal branch of the retinal artery was transformed into a white cord. There were some corkscrew veins visible in the same quadrant. The other branches of the retinal artery were narrow, with an increase in the light reflex and considerable sheathing; there was a tapering, banking, and deflection of the veins at the arteriovenous crossing. His corrected vision equalled 20/40, J3. He had a sector-shaped defect in the visual field nasally and above.

The effectiveness of vasodilating drugs has been open to considerable doubt in spite of the fact that these drugs were used to treat conditions supposedly caused by diminished blood supply. In many instances these drugs are without any effect, in other instances they may actually decrease the intraocular blood volume, secondary to dilatation of the peripheral vascular bed. Peripheral-acting drugs, depressing the smooth vascular muscles, like nicotinic acid, were found to have no effect on the intraocular blood volume except when they were given by retrobulbar injection. Retrobulbar procaine was found to increase the intraocular blood volume only when given in large doses. The effect might be secondary and caused by local irritation. This case was presented for two reasons:

1. It is very rare that a patient has the understanding that he is in a state of emergency, and only few cases are seen so early after an intraocular vascular catastrophy.

2. To evaluate the effectiveness of the treatment applied and the cause for the relaxation of the vascular spasm. Papaverine acts directly on the smooth vascular muscles, predominantly on the arteries of the brain and on the coronary arteries, and supposedly has no effect on the intraocular blood volume. The same is true for comparatively small doses of retrobulbar procaine. However, experimental studies and corresponding results do not preclude that, under certain abnormal conditions such as retinal spasm, changes in retinal blood flow might occur in response to similar drugs.

Visual result after goniotomy

Dr. J. Wesley McKinney reported the case of W. McB., aged five months, who was first seen on June 12, 1945, at the Eye Clinic of the Memphis, Eye, Ear, Nose, and Throat Hospital.

He had had a bilateral trephination for congenital glaucoma six weeks previously. The tension, however, was again elevated, and both corneas showed edema and generalized nebulosity. Both trephination blebs were flat and evidently not filtering.

Under ether anesthesia, the tension was found to be 30 mm. Hg (Schiøtz) in each eye. The corneas measured 13 mm. in diameter. Goniotomy was performed, opening about one fourth of the angle in each eye. The postoperative course was uneventful.

The child was seen again six months later. The corneas were clear and the tension was so definitely normal to fingers that he was not checked under anesthesia.

He returned for checkup on December 22, 1954, now aged nine years. Unfortunately, I did not see the child myself at this time, but the clinic note showed the vision to be: O.D., 20/20; O.S., 20/40; and tension was found to be: O.D., 19 mm. Hg, and O.S. 15 mm. Hg (Schiøtz). It was reported to me that the eyes seemed a little large but otherwise they appeared in every way normal.

He again returned to the clinic November 28, 1956, now aged 11 years. His clinic note showed refraction to be: O.D., +0.25D.

sph. ⊂ +0.25D. cyl. ax. 80°, 6/6; O.S., +0.5D. sph. ⊂ +0.5D. cyl. ax. 65°, 6/7.5−2.

The corneas were clear and measured 13 mm. in diameter in each eye. The tension was O.D., 19 mm. Hg; O.S., 20 mm. Hg (Schiøtz). The fundi were normal.

Subacute iritis complicated by acute glaucoma

Dr. Philip Meriwether Lewis reported a case of acute glaucoma in both eyes which developed while the patient was under treatment for iritis. C. G., a white man, aged 68 years, was first seen on April 27, 1956, because of a red, painful left eye of five days' duration. There had never been any previous trouble with his eyes and he had never worn glasses. He had been using cortisone locally for several days but said he was getting worse.

Examination showed the left eye to be highly inflamed and vision only 4/200. The cornea was slightly hazy. There were no keratic precipitates. The iris was congested and there were numerous posterior synechias. There were many cells in the aqueous. The anterior chamber was quite shallow and the angle was narrow. The tension was 35 mm. Hg (Schiøtz). There was no congestion of the right eye. Vision was 20/40. The anterior chamber was shallow and the angle narrow. There was nuclear clouding of the lenses of both eyes. Neither disc showed any cupping.

A diagnosis was made of subacute iritis with secondary glaucoma, left eye. He was given 500 mg. of Diamox by mouth and neosynephrine (10 percent) and prednisilone locally. After two hours the eye was more comfortable and the tension was 26 mm. Hg. It was 17 mm. Hg in the right eye. He was then admitted to the Memphis Eye and Ear Hospital for etiologic studies and treatment with typhoid-H antigen intravenously, mydriatrics, and local prednisilone. On the next day the eye was very little better and a slow intravenous drip containing 20 mg. of corticotropin was given. About four o'clock the following morning he developed severe pains in his head accompanied by nausea and vomiting. He was so ill that he did not notice for several hours that he could scarcely see with either eye.

It so happened that this occurred on a Sunday morning and the patient was not seen until 10:00 A.M., about six hours after the attack had begun. Both eyes presented a typical appearance of an acute attack of glaucoma. Tension was 80 mm. Hg, O.D. and 70 mm. Hg, O.S. Large doses of Diamox and Demerol intramuscularly, procaine with adrenalin by retrobulbar injection, and powerful miotics frequently, gave only temporary relief and failed to reduce the tension adequately. The following morning the tension was 60 mm. Hg in the right eye and 50 mm. Hg in the left eye. An ab externo incision was made in both eyes. A peripheral iridectomy was done in the right eye and a complete basal iridectomy on the left. It was necessary to use a spatula to break the anterior and the posterior synechias of the left eye.

Following operation there was complete relief from pain and both eyes were soft. The right eye remained soft but the pressure in the left eye rose to 45 mm. Hg after five days and remained at about that level. Eight days after the iridectomy, a cyclodiathermy was performed on the left eye. While making the punctures, the scleral wound broke open and the anterior chamber was lost. The scleral wound was resutured with 6-0 chromic catgut and the anterior chamber filled with air. No complications followed this surgery. The tension was reduced to normal. When last seen four weeks later corrected vision was: O.D., 20/30; O.S., 200/100. The tension was: O.D., 15 mm. Hg; O.S., 23 mm. Hg.

Although the anatomy of the anterior segment in this patient gave a predisposition to primary narrow-angle glaucoma, the development of an acute iris block of both eyes while the patient was in the hospital for

treatment of a subacute iritis of one eye is unique in my experience. What led to this is a matter of interesting speculation. It was certainly not the mydriatics used in the left eye because they would not have affected the right eye. Probably the ordeal associated with an eight-hour intravenous drip was a factor and perhaps there was some fluid retention produced by the ACTH. It may be unwise to use intravenous ACTH in cases of this type.

Eugene A. Vaccaro,
Recording Secretary.

MADRID OPHTHALMOLOGICAL SOCIETY

February 27, 1957

Keratoconus treated with keratoplasty

Dr. Arjona Santos demonstrated a keratoconus case successfully treated with penetrating keratoplasty.

Ophthalmoplegic migraine

Dr. Jiménez Jordán presented two cases of ophthalmoplegic migraine.

He reviewed the syndrome and then proceeded with the clinical histories: two women, one aged 50 years, the other aged 80 years. They were suffering from a typical trigeminal pain and paralysis of the lateral rectus of the affected side. In one of the patients there was a paralysis which started as periodic and later became permanent. Dr. Jorán considered the most probable etiology was an aneurysm of the circle of Willis and recommended arteriographic studies in order to obtain an early diagnosis and ligation of the carotid as the treatment of choice.

Discussion: Dr. del río cabañas commented on the etiology of Charcot's syndrome adding hysteria as a possible factor. He cited Freud's case of oculomotor paralysis in a young girl who had received slight orbital trauma during a period of time when she was caring for her sick father. Months after the father died the paralysis appeared and was treated successfully with psychoanalysis.

Dr. mario esteban remarked on the fact that he did not consider ophthalmoplegic migraine a nosologic entity but simply a syndrome with multiple causative agents among which the most important were: virus infections, vascular conditions (aneurysms), and tumors. Prognosis is serious as testified by the lesions that have been found in autopsies. Dr. Esteban agreed to the need for cerebral angiography as an aid to diagnosis and surgery.

Dr. marin amat summarized his criteria for ophthalmoplegic migraine as:

1. Because of its progressive evolution, the cause is organic; exceptionally it may be due to a functional disturbance and then the cases are not progressive and the syndrome can be made to disappear.

2. Usually it begins with pain and next with a paresis of III nerve which later becomes paralyzed. However the VI nerve may be the first one affected, as in Dr. Jiménez Jordan's cases, and in one of my cases which also presented a Claude Bernard-Horner syndrome of the same affected side.

3. I believe the symptomatology to be due, in the first case, to a lesion of the wall of the cavernous sinus and, in the second case, to a localization inside the sinus, where the VI nerve and the sympathetic plexus are lodged.

4. Whether the III or IV nerve is the one specially affected, the lesion invades progressively the VI, VII, VIII, II, and superior maxillary. Other cerebral dysfunctions appear.

5. It is a disease, usually, of mature age and of grave prognosis.

6. At the beginning, the disease is purely ophthalmologic, later the neurologist and neurosurgeon should be called upon.

7. The site of the lesion, at the beginning, is the medial cerebral fossa, at the place

which we call the region of ophthalmoplegic migraine.

8. The treatment should be carried out by the neurosurgeon.

Olga Ferrer,
Translator.

COLLEGE OF PHYSICIANS OF PHILADELPHIA

Section on Ophthalmology

April 18, 1957

Dr. I. S. Tassman, *Chairman*

Incisions in cataract surgery

Dr. John M. McLean (New York) reviewed incisions and their closure in cataract surgery, with a brief historical outline from the operation of Daviel to the present. Most surgeons today prefer the limbal incision above with a conjunctival flap. Arguments for the limbal-based and fornix-based flaps were reviewed and the case for omission of the flap considered. Eccentric or anterior corneal incisions were recommended in the presence of functioning filtration operations and wholly corneal incisions without flaps for bleeders. Short, deep, posterior scleral incisions were recommended for Fuchs' dystrophy.

Accurate, multiple, radial, preplaced corneoscleral sutures are strongly urged in all cases. The merits of chromic gut versus silk were discussed. Dr. McLean has always favored silk but is inclining more to gut. Better needle design and production are making the postplaced suture safer and easier.

A motion picture of an unusual incision combining a wedge-shaped excision of cornea for keratoconus and cataract extraction was presented.

William E. Krewson, 3rd,
Clerk.

NEW YORK SOCIETY FOR CLINICAL OPHTHALMOLOGY

March 4, 1957

Dr. Max Chamlin, *presiding*

Cardiac arrest: Its prevention and management

A film on the subject, produced by the American Cyanamid Company, was shown. With a dog's heart exposed, the steps in the development of cardiac arrest and ventricular fibrillation were demonstrated and the treatment by massage and use of a defibrillator presented.

Dr. Edwin Emma discussed the condition from the viewpoint of the anesthesiologist and Dr. Charles B. Ripstein did the same from the viewpoint of the surgeon.

Dr. Emma emphasized that it is the responsibility of a surgeon starting any operation to be prepared to treat adequately cardiac arrest if it should occur in his patient. This applies to ophthalmic surgeons as well as any other specialty.

The causes of cardiac arrest can be ascribed to (1) hypoxia, (2) hypercarbia, (3) irritable heart.

The diagnosis is made by the anesthetist from the appearance of the patient plus total absence of pulse and blood pressure. The surgeon makes the diagnosis on the basis of sudden absence of bleeding from cut edges plus the absence of palpable pulsations in the operative field.

At this point, one has three minutes to establish circulation before irreversible damage occurs. Therefore, do not waste time, wait for an electrocardiogram or a defibrillator, give drugs, or procrastinate and hope that the heart restarts. The anesthetist must stop the administration of the anesthesic agent, ventilate with 100-percent oxygen, intubate the patient if any obstruction is present, and note the exact time of onset of episode.

The surgeon must open the chest and massage the heart.

The circulating nurse must obtain a chest pack, defibrillator, cardioscope, and assistants for surgeons and anesthetist.

After three to five minutes of massage and oxygenation, it is then possible to evaluate the situation.

If a normal beat is present, continue to massage in rhythm until the blood pressure is maintained and contractions are vigorous.

If contractions are weak, one mg. of neosynephrine or 12.5 mg. of ephedrine is given intravenously. Observe the heart for 20 to 30 minutes of adequate action, then close the chest with attention to hemostasis.

If ventricles are fibrillating, use a defibrillator serially one to three times as needed. The pericardium should be open for good contact. A two-amp. 110-volt shock should be given for 0.1 second. Follow arrest with massage. If a spontaneous beat starts, follow the procedure outlined in the preceding paragraph.

If the heart has remained in arrest, continue massage for several minutes before resorting to drugs. If a systole is considered to be reflex, give 1.0 mg. of atropine in 10-cc. saline into the left ventricular cavity. If the heart is firm, six to 10 cc. of 10-percent calcium chloride are injected into the left ventricular cavity. If the heart is flabby, one cc. of 1:1,000 epinephrine with nine cc. of one-percent procaine is injected into the left ventricular cavity. After and during all these administrations, massage is continued. If the heart starts, follow the procedure as previously indicated. If fibrillation develops, follow the procedure outlined for this condition.

Dr. Ripstein said that, once the diagnosis of cardiac arrest is made, one must without delay and without attention at all to sterile technique make a bold controlled incision through the chest in the left fourth intercostal space. The pericardium is then opened from base to apex, avoiding the left phrenic nerve, and massage of the heart is instituted. The hand is opened widely, the heart is squeezed and released quickly with a snap, and this is done at the rate of 60 per minute. The closure of the chest is accomplished by suturing in layers; it is not necessary to close the pericardium. It is essential to insert a tube into the chest for an underwater drainage system. Dr. Ripstein said that cardiac arrest can occur with local anesthesia. He thought that every ophthalmic surgeon should take a short one-day course in cardiac resuscitation.

Recent advances in ocular sutures

Dr. Bernard Kronenberg said that the most common suture materials used in ophthalmology were silk and catgut. Braided or noncapillary silk is preferred by most surgeons. Silk is best used in dry form because wet silk loses 15 percent of its strength. Absorbable sutures, known as catgut, are used either plain or chromic. The latter has been tanned to resist digestion. The degree of tanning determines the chromitization of the suture. Uniform tensile strength is important for all suture material. Cotton and nylon were discussed. Recent advances in the production of both eyed and eyeless needles were pointed out. The curvature and shape of the needlepoint are important. A new type curved needle which has no cutting edge above or below but on the sides was considered ideal for ocular surgery.

General anesthesia in ophthalmic surgery

Dr. Arthur Leeroy said that ophthalmic surgeons have been reluctant in the past to use general anesthesia because of the quality of the service. With the advent of the specialty hospitals, and the increased demand recently, full-time anesthesiologists have developed special techniques to remove the objections of surgeons and patients alike, to achieve optimum conditions for operation and recovery, especially in intraocular work. Here the face mask is contraindicted and the intratracheal tube undesirable, making para-

mount experience in judging anesthetic depth by respiratory exchange.

Insufflation of ether vapor through metal airways with suction catheters in them is safe in children. Intratracheal methods and preoperative sedation, including rectal barbiturates, are unnecessary and create increased postoperative morbidity, besides delaying the start of surgery.

Short-acting barbiturates, intravenously by continuous drip, combined with maintenance of a patent airway by use of rubber pharyngeal airways connected directly to the gas machines provide safe anesthesia with optimum conditions for surgery and recovery that is not detrimental. The importance of regulating the dosage to the needs of the patient, while avoiding the fallacy of overeconomy of dosage, are criteria for good results.

Variations of the method, such as different solutions, different strengths of solution, use of smaller needles and smaller veins, premedication, and topical anesthesia of the throat were discussed.

Deepening of the anesthetic plane through the unobstructed intravenous route seems the logical treatment of laryngospasm, though it takes the courage of one's convictions to employ it properly. Airway patency with rubber airways left in, with the patient flat on his back postoperatively, aids uncomplicated recovery. Monitoring of the respiration by auscultation of the delivery tube at the machine gives critical evaluation of anesthetic depth. Connection of the rubber airway by lightweight flexible tubing through a soda-lime cannister and rebreathing gab gives good control for use of nitrous oxide-oxygen mixtures to economize dosages in the longer cases.

Endotracheal techniques for intraocular surgery are contraindicated because of the probability of stimulation of cough reflexes during or after surgery.

Lack of postoperative nausea and vomiting, attained by intravenous anesthesia in the adult, are not achieved in the child in whom relative overdosage might occur because of higher metabolic rates. This, along with difficulty of placid venepuncture, precludes the usefulness of the method for the young while, conversely, enhancing success in the elderly. Because of the unpredictability and masking of the respiratory signs of anesthetic depth, use of the muscle relaxant drugs is hazardous in eye surgery at the present time.

For safety in children the older anesthetic methods are preferred; for adults, especially for intraocular surgery, the intravenous method offers optimum operative facility with most favorable recovery conditions.

Jesse M. Levitt,
Recording Secretary.

YALE UNIVERSITY CLINICAL CONFERENCE

December 14, 1956

Dr. R. M. Fasanella, *presiding*

Lid and facial burns

Dr. Donald P. Shedd opened his discussion with a general consideration of burns. He noted that patients with over 75 percent of the body surface burned usually die despite all treatments. Where a 50-percent burn is present, they occasionally recover. With a 30-percent burn, they should usually survive with good therapy. The general problems include:

1. Burn shock. This is an oligemic type of shock with loss of fluids, especially into the tissues around the burn. This fluid is truly lost to the patient in the early period.

2. Infection, local and bacteremic. This is the major cause of death in patients surviving the initial period.

3. Acute renal insufficiency.

Later problems include those of anemia and malnutrition which may be very severe, and problems of rehabilitation, cosmetic, functional and psychologic and so forth. The burned patient who later develops a bac-

teremia has a fairly well-defined syndrome, including chills, fever, dehydration, disorientation, and paralytic ileus. An acutely toxic patient a few weeks after a burn usually has a bacteremia, generally staphylococcic or from a gram-negative organism.

Various degrees of severity of burns were described and Dr. Shedd noted that it was often hard to tell the degree of a burn during the first 10 days. Some burns that look superficial often turn out to be third degree. After burning, there is an initial inflammatory response, then burn edema for a few days, with further developments depending on whether infection occurs. Infection is almost inevitable in deep burns. Then dead tissue sloughs, about two weeks later in a second-degree burn and about three weeks or even later in a third-degree burn. One is then faced with an open healing wound with problems in malnutrition. There may be healing by epithelization from adjacent tissues, by contracture, or by skin grafts. Contracture is a bad method, although it is nature's method.

Dr. Shedd then discussed more specifically the problem of facial burns, which are rather frequent. The early problems are those associated with burn edema, where the lids are swollen and there may be respiratory obstruction and considerable venous engorgement in the head. Some patients need early trachiotomy, which has been one of the great advances in this type of burns. Delayed problems are those of cosmetic and functional deformities of ears, nose, mouth, and chin where scars are restrictive.

In eye injuries, it was his experience that usually the cornea is spared. The restoration of lid function is very important in order to protect the globe and lid function is affected by adjacent scars.

Major advances in the treatment of burns in the recent years are:

1. A clearer understanding of the fluid-balance problems and their treatment. One would currently determine the percentage of bodily surface burn and the body weight and in this way estimate the approximate fluid and protein needs of the patient. Nutritional advances have been very important.

2. A better understanding of the need for special nursing and doctor care in burns. In severe cases, practically hourly care by a doctor is necessary for 36 to 48 hours for maximum benefits.

3. A stryker frame facilitates the turning of the patient.

4. Dressings have given way before the increased popularity of the open-air method of treatment. This is somewhat bacteriostatic if pus is not allowed to accumulate underneath the crusts. We try to use it wherever we can. It is uncomfortable for the first 48 hours but thereafter it is better and there is considerably less odor.

5. Antibiotics are important, although there are many drug-resistant organisms. I tend to use bacitracin and albamycin often, but switching from one antibiotic to another at critical times may be helpful.

6. In regard to steroids, I feel they have no role unless there is demonstrated adrenal insufficiency.

7. Increased aggressiveness in the care and covering of burns. The use of debridement, Varidase, Tryptase, and so forth to allow grafting in three or four weeks. A Hubbard tank helps with the cleaning process.

Of importance in eyelid burns are:

1. The prevention of corneal exposure. Corneal exposure in the healing period may result in late loss of vision. Grafting is usually possible earlier in the eyelids. Early tarsorrhaphy may not work out too well because of tissue friability. One may be better off with an early graft. Eyelid grafting has priority over the rest of the face in order to protect the eyeball, aid appearance, and avoid ectropion. Occasionally, an early ectropion may improve spontaneously. With a significant degree of ectropion, one must replace the scar tissue with free graft. Local flaps are not usually very good; better are thin split-thickness grafts from the medial sur-

face of the upper arm. If very small, a full-thickness graft from another lid is usually the best. Occasionally postauricular skin can be used. Occasionally intial grafts contract and may require a second graft later. Some full-thickness grafts look boggy. Some thinner grafts take better but constrict more and occasionally reduce by as much as one fourth of the original size.

Dr. Shedd then discussed the techniques of eyelid grafting and explained the use of a Padgett dermatome and the Brown dermatome. He considered a thin split-thickness graft as one of 0.005 inches in thickness and a thick one as 0.025 inches of thickness. He noted that one could reuse the same donor site three or four weeks later in cases where thin grafts were taken.

A graft in the first three or four days is essentially a tissue culture, after this vascularization begins. The take of the graft depends on several things, including the accuracy of approximation to the bed and the maintenance of a motionless dressing for the healing period.

In summary, he felt that it should be possible to spare the eyes through the combined efforts of the ophthalmologist and the plastic surgeon. Early or immediate excision of the damaged tissues and immediate grafting may be considered possible in a few cases where small localized areas are involved. In large areas it is difficult to tell whether some areas are still viable. Homografts may occasionally be satisfactory for temporary use.

Discussion. Dr. Fasanella: What is your immediate emergency treatment of a facial burn?

Dr. Shedd: Put nothing on it.

Dr. Freeman: In many cases, the blink reflex is interfered with and a stare develops. To avoid exposure, a methyl cellulose solution, applied hourly, may be useful to protect the cornea.

Dr. Fasanella: In war cases in which phosphorus bombs had caused facial burns, we often found it advisable to darken the room. Small particles of the phosphorus could be debrided better by noticing the small spots of phosphorescence.

William I. Glass,
Recording Secretary.

Ophthalmic Miniature

Gairloch, 15th Sept. 1925.

Dear Mrs. Edwards

My own sight varies absurdly, especially as to my long sight. Sometimes I can see better without my long distance spectacles than with them. Sometimes the spectacles are indispensable. Even at reading distance I can sometimes tell the hour from my watch without glasses quite distinctly. Then again I can make out nothing without them.

ever
/s/ G.B.S.

From a letter by George Bernard Shaw, collected by
James W. Smith, M.D., New York

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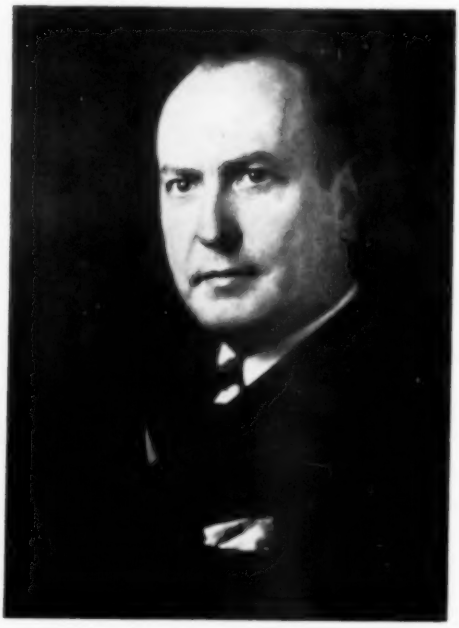
HAIL TO THE CHIEF

Last month THE AMERICAN JOURNAL OF OPHTHALMOLOGY paid tribute to an illustrious British ophthalmologist on the occasion of his sixtieth birthday by issuing the "Duke-Elder" supplement. This month the Associate Editors of THE JOURNAL wish to present similar birthday greetings to one of America's best known and most beloved ophthalmologists, our distinguished Editor-in-Chief, Derrick T. Vail. This editorial, which appears entirely without his knowledge or consent, has been inserted in THE JOURNAL by cunning connivance and intricate maneuvering behind the scenes, thereby escaping the firm veto and editorial blue pencil wielded by our modest Chief. It will, we hope, be received and accepted by him as

a sincere acknowledgment of our appreciation of him as a man, an ophthalmologist, and editor, and a friend.

The son of an eminent American ophthalmologist, Derrick T. Vail, Sr., our Derrick was not content to live on inherited and reflected glory but began early in his profes-



DERRICK VAIL, M.D.

sional life to carve for himself an important place in our specialty. To name in detail the various positions he has held and honors which have ben awarded him would be superfluous. His war service as chief of ophthalmology in the E.T.O., his contributions in the educational field at the University of Cincinnati and for the past 12 years at Northwestern University, his editorial and literary attainments, his scientific contributions, his labors on the American Board of Ophthalmology, and his energetic participation in innumerable committees and organizations are well known and bear tribute to a remarkable versatility. He has served as president of the American Academy of Ophthalmology and Otolaryngology, Chairman of the Section on Ophthalmology of the A.M.A., and is at present vice-president of the American Ophthalmological Society. He has received the Outstanding Contributions Medal of the A.M.A. Section on Ophthalmology, the Doyne Medal of the Oxford Congress, before which he delivered the Doyne Lecture in 1957. He was the de Schweinitz Lecturer in 1945 and the Proctor Lecturer in 1947. In 1952, he presented the Montgomery Lecture in Dublin.

As Editor-in-Chief of THE AMERICAN JOURNAL OF OPHTHALMOLOGY, Derrick Vail has made perhaps his greatest contribution to the progress of ophthalmology. Under his leadership THE JOURNAL has prospered and expanded to become a leading influence throughout the world. In spite of heavy responsibilities, multiple obligations, and several bouts of illness his enthusiasm and labor for THE JOURNAL have never ceased.

Unspoiled by honors and high position, Derrick retains the qualities of humility, quiet humor, loyalty to his friends, and a firm conviction in the highest ideals of medicine. A strong family man he has been greatly aided by his loving and understanding wife, Elizabeth.

Mr. Editor, may we extend to you our congratulations on your sixtieth birthday, express to you our admiration and love for you as a man, and wish for you many future years of undiminished activity in the service of ophthalmology.

Hail to the Chief.

The Associate Editors.

THE NATIONAL MEDICAL FOUNDATION FOR EYE CARE

This organization of ophthalmologists was established in the Fall of 1956 during an interlude in the meeting of the American Academy of Ophthalmology and Otolaryngology, to replace the original Committee on Public Relations of the Section on Ophthalmology, A.M.A. A recent decision of the

Board of Trustees of the A.M.A. and confirmatory action of the House of Delegates, had ruled that the various sections of the parent organization were scientific bodies only and, therefore, had no autonomous function in the realm of nonscientific matters. Up to that time our Public Relations Committee, under the able direction of Ralph O. Rychener, had done well an arduous and even thankless job, in spite of a high cost in time, effort, and personal expense.

In the March, 1955, number of THE JOURNAL, I presented an editorial, "Unmasked" (Am. J. Ophth., **39**:425, 1955). It was pointed out that certain resolutions adopted by the 1954 congress of the American Optometric Association indicated that optometrists apparently aimed toward absorbing by legislative measures everything pertaining to vision, except for medical and surgical conditions of the eye. As the result of this open challenge, loudly disclaimed by the official bodies of optometrists up to that time, the editorial urged that counter-action be taken by orangized medicine, preferably by the A.M.A.

The matter was referred to the Judicial and Legislative Council of the A.M.A., which prepared a valuable analysis of all of the legislative acts pertaining to optometry in the various states, and a report was released to the medical profession. I am not aware of any further activity of the A.M.A. in this matter.

Ophthalmologists are, unhappily, too familiar with the long record of aggressive and often restrictive activities of a legally functioning, nonmedical group to insinuate itself into the field of the entire care of the eyes; to befuddle and confuse the public by appropriating the title of "Doctor," well knowing that by this term the public would and does think the title a medical one or at least very closely associated with medicine and healing; and through a militant national lobby, which I must ruefully admit is a highly effective and troublesome one, to influence legislation favorable to itself and unfavorable to opticians and ancillary technicians employed by physicians.

It seemed necessary, therefore, for ophthalmologists themselves to unite in an organization whose basic purposes, as officially established by the Foundation, would be to "seek to promote the conservation of vision and the prevention of blindness through effective utilization of the scientific knowledge of ophthalmology and related branches of medicine. The Foundation will serve the public interest by helping the American people to understand the basic professional and scientific standards of good eye care, and the qualifications and functions of ophthalmologists and of the related technical personnel who assist them in providing eye care to the public."

This Foundation should have been established a long time ago, for the confusion in the minds of the people, including professional persons who should know better, over the fundamental difference between the ophthalmologist and the optometrist, between a medical specialist and a nonmedical technician, has grown with the years, and with it the arrogant power of the optometric organizations.

Harold F. Falls, a trustee of the Foundation, in the place of the president, Ralph Rychener, who was ill, gave the first annual report of the organization at the Palmer House, Chicago, on October 15, 1957, to members and friends. Among many other important things he said was this:

"We are *not* organized to fight optometrists! We do *not* oppose optometry, so long as its practitioners remain with the confines of optometry! We *are* opposed to the pretensions of certain groups within optometry and to the aggressive techniques that would take them far beyond the field of activity that is indicated by their technical training. We will continue to oppose in every legitimate way the legislative and civic invasion of the practice of medicine that seems to have become the settled policy of certain

segments of organized optometry. We propose to carry on this effort principally by education, directed first to our own colleagues; secondly, to the entire medical profession; and, finally, to the public."

This is, indeed, a clear statement of one of the chief purposes of the National Medical Foundation for Eye Care.

What has the Foundation accomplished in its first and critical year of formation? Dr. Fall's report, too long to incorporate here, has already been published in pamphlet form and distributed to members and to many nonmembers. It is a remarkable report of many things that have already been done in this short time and most encouraging for future achievements. Already, the total membership to date is nearly 2,400, of which approximately 300 are affiliates. Not bad for getting off the ground but not good enough to sustain certain and soaring flight. Carl C. Koch, editor of the *Archives* of the American Academy of Optometry, calls the membership of the Foundation a "splinter group," implying that it does not have the support of all ophthalmologists but only of a disgruntled segment thereof. I do not believe this to be true. On the contrary, as the purposes for which the Foundation was established become better known, I am confident that most ophthalmologists will become members. If there is a splinter group then, it will consist of physicians who are either indifferent to this critical problem, or of those who have a vested interest of one sort or another.

Every ophthalmologist, indeed every one of our medical colleagues, should be a member of the Foundation, for we are all deeply concerned. As Dr. Falls said in his report:

"We know that our position is truly in the best interest of the people. We know that the truth, the facts of the matter, are on our side of the argument. And we have demonstrated again and again that we have only to get a hearing for our case to gain a convert to our cause."

If, therefore, you are not a member, you are letting ophthalmology and medicine down badly.

In addition to the first annual report, the pamphlet, *What is an Ophthalmologist?* has already been distributed to more than 300,000 people, and has had impact. The report to the medical profession, *Medicine, Optometry and the Public Welfare*, a 50-page booklet, is a critical and fairly stated study. It was sent to many physicians who have gained insight for the first time into what has been going on. These pamphlets are available to anyone who wants them. If you have not received the literature, write in for it. More informative material and studies are being gathered and will be printed in the future. It is most important that our people, particularly physicians and legislators, honestly and clearly understand the difference between optometry and ophthalmology. When they do, we shall have no fear of the response, for the truth is there for all to see.

Derrick Vail.

CHICAGO OPHTHALMOLOGICAL SOCIETY CLINICAL CONFERENCE

The 1958 Chicago Clinical Conference held on February 21st and 22nd was again the occasion of the annual Gifford Memorial Lecture. This, the 14th, was given by Dr. Phillips Thygeson who spoke on "Cicatrizing conjunctivitis." Later in the program Dr. Thygeson also spoke on "Differential diagnosis of superficial lesions of the cornea."

In large part the rest of the program was surgical in nature. On the morning of February 21st a panel on management of the complications of ophthalmic surgery was held. A brief formal presentation was given by each of the five members of the panel after which the rest of the morning was devoted to questions from the floor. Audience response was enthusiastic which would seem to indicate that one's surgical complications are perhaps more frequent if one can present them anonymously.

In the afternoon Dr. Lorenz Zimmerman gave a pathologic discussion of intraocular granulomatous inflammations. The following day he discussed the pathology and prognosis of melanotic tumors of the iris.

Dr. P. Robb McDonald devoted himself to retinal problems and spoke on "Vitreous syndromes" and also gave a conservative and enlightening presentation on the choice of operation for retinal detachment.

Dr. Wendell Hughes continued the presentation of topics of surgical interest with two papers: One on "Management of the patient with glaucoma and cataract" and a second on "Plastic surgical techniques." Both of these were illustrated by the excellent cinematography which has become a characteristic of Dr. Hughes' expositions.

A special note of pleasure was added to the conference by Dr. Derrick Vail's presentation of his Doyne Lecture, "The zonule in cataract surgery." The final paper of the program was a moving picture made by Dr. Nicholas Wetzel, a neurologic surgeon, on "Oculomotor aspects of some neurosurgical disorders."

The social side of the meetings consisted of two luncheons and a buffet dinner and the audience was unanimous in its feeling that the excellence of the culinary repast was exceeded only by the intellectual feast provided by Dr. Joseph Alfano, the chairman of the meeting.

David Shoch.

TENTH ANNUAL CLINICAL CONFERENCE OF WILLS EYE HOSPITAL

The 10th annual clinical conference of the Wills Eye Hospital opened on February 20, 1958. The first day was devoted to rounds in the institution and the observation of a variety of surgical cases performed by members of the staff. These included cataract extractions, glaucoma procedures, corneal transplants, muscle surgery, repair of retinal detachments, and plastic procedures. Those attending the surgical clinics were able to see several different surgical techniques on each type of case and had the opportunity of discussing the choice of operation and the management of patients, as well as the various steps in the surgical procedures with the operating teams.

After a dinner at the Union League in honor of Dr. Georgiana Dvorak-Theobald, the assembly listened attentively to her experiences with a variety of ocular pathologies at the Section on Ophthalmology meeting of the College of Physicians of Philadelphia. Dr. Theobald reviewed her own beautiful contribution to our knowledge of the trabecular structures in the angle of the anterior chamber and had time to present some unusual cases, such as melanoma of the cornea, as well as to demonstrate a case of uveitis of proven tuberculous origin and careful analysis of pigmented lesions of the optic nerve and posterior fundus.

Friday morning was devoted to the experiences of the Wills group with cases of uveitis. Dr. Joseph W. Hallett summarized the experience of the investigating group with antibody titers against hyaluronidase and streptolysin in patients with uveitis as followed at the Wills Eye Hospital over the past five years. As time progresses and more figures are obtained, it has become apparent that less correlation can be shown between these titers and any particular type of uveitis. The uveitis patients do not appear to be unique from the general population in their demonstration of abnormally high titers of antibodies against the streptococcus. These tests do not appear to be helpful in the etiologic diagnosis of uveitis.

Dr. Thomas R. Hedges, Jr., offered a number of patients who had definite evidence of sarcoid involving the eye and reviewed the relationship of sarcoid to uveal disease.

Dr. Michael I. Wolkowicz pointed to the infrequency with which one encounters any abnormality in diurnal fluctuations in body

temperature in patients with uveitis and was impressed by the slightly increased incidence of abnormal sedimentation rates in patients with uveitis. His studies demonstrated experimental production of antibodies against C-reactive protein within the eye to a greater level than encountered in the general circulation. The C-reactive protein levels had no specific diagnostic value but appeared, from the initial studies, more closely related to the anterior forms of uveitis than to the posterior variety, although elevations of C-reactive protein content were encountered in uveitis in both anatomic areas.

Dr. Irving H. Leopold provided the results of experimental investigations into the penetration of Daraprim or Pyrimethamine into the ocular tissues and fluids following systemic administration. The degree of penetration was determined by a bioassay technique. In order to obtain theoretically adequate concentrations against the actively growing Toxoplasma organism in the ocular tissues, concentrations in the range of 2.0 mg./kg. administered intravenously were required. This is much higher than any dosage employed in the clinical studies reported to date. The oral route was used in the clinical reports. These studies suggest that the dosage employed is much lower than one would anticipate would be beneficial for active ocular infection and should not be adequate for the encysted form. It is unlikely that the dose of 25 or 50 mg. orally daily would be adequate for the proliferating form within the ocular tissues. These studies therefore cast doubt on the presently recommended dosage schedules.

Dr. Leopold pointed out that Daraprim is a toxic agent which affects the white cells and platelets before it produces definite changes in the red blood cells. According to these experimental studies, one would anticipate that an oral dose of 150 mg. would be required per day in order to be effective in the retina where the Toxoplasma organism has been found. However, this dose may be much too high from the toxic standpoint and one should consider the use of such dose with considerable caution. Perhaps, the use of folinic acid along with Daraprim, as suggested by Frenkel, may prevent some of the toxic features without impairing the therapeutic efficiency of the drug at this high dosage schedule. Further study along this line is indicated. A much more effective agent against Toxoplasma with a lower degree of toxicity is desirable.

Dr. Harry Green lucidly summarized the concepts of aqueous humor formation and considered the mechanism of Diamox action. He pointed out the many unknown factors concerning Diamox action. The results of his research team on the bicarbonate values in aqueous humor of human eyes were particularly interesting. The bicarbonate concentrations in eyes with cataracts were usually lower than that of the venous blood but the values increased in eyes with malignant melanomas. Normal eyes showed concentrations which were fairly similar to those in the venous blood.

Dr. Samuel Askovitz demonstrated a new method for testing the amplitude of cyclofusion by the use of a special prism and a simple apparatus that appears to have definite possibilities for rapid screening of patients.

Dr. E. C. Schrader and Dr. Nathan Schlezinger analyzed the results in over 100 patients with isolated sixth-nerve palsies who presented themselves to the Wills Eye Hospital for diagnosis. The etiologies were either cerebrovascular disease, diabetes, brain tumors, trauma, or syphilis. Most of the cases in these series fell into the group of cerebrovascular disease. Diabetes was a common cause of sixth-nerve palsy in this group. It is interesting to note that brain tumors were a less frequent cause.

Dr. William Krewson carefully considered the present status of orthoptics. He noted that there are many centers in which this field of ophthalmology has been largely discarded except for its diagnostic value, but

pointed out several areas in which orthoptics can be useful. He stressed that thorough investigation and review of the past and potential contributions of orthoptics to ophthalmology are indicated.

Dr. Wilfred Fry and Dr. Howard Hill presented films demonstrating their cataract extraction techniques, particularly their type and method for insertion of corneal scleral sutures. Dr. Fry's method was a modification of Verhoeff tract suture and Dr. Howard Hill used a preplaced corneal scleral suture buried under a limbus-based flap.

Dr. Robert Brown reported encouragingly on his experience with the anterior chamber plastic implant following cataract extraction.

There was sufficient time for the assembled group to discuss the events of Thursday and Friday in greater detail over libations and sustenance on Friday night. Many of these discussions flowed until the wee small hours. The Friday night activities in no way dampened the ardor of the group for the Saturday morning as well as the Saturday afternoon sessions.

On Saturday morning, Dr. Charles Steinmetz showed the double-pointed tapered needle for conjunctival closure which has proved so useful in cardiac surgery. It appears to have definite value for rapid closure of conjunctiva, particularly that which may be torn easily.

Dr. Hanno followed with two presentations, one concerning leukemia as a cause of unilateral exophthalmos which occurred not only in children but also was encountered in an adult. In discussion, Dr. Ralph Hamilton presented the involvement of both lacrimal glands in an elderly patient with leukemia who responded dramatically to steroid therapy. The diagnosis was confirmed by biopsy of the lacrimal gland.

Dr. Hanno followed this with a presentation of seven cases of central artery occlusion in youngsters. One showed dramatic improvement of visual acuity when therapy was instituted 12 hours after onset. All of these youngsters had rheumatic heart disease.

Dr. Edward Donnelly reviewed the systemic and ocular findings in multiple myelomatosis. In discussion, Dr. Hanno suggested that the ophthalmologist look for sludging of the blood in the conjunctival vessels as a possible indicator of this entity.

Dr. Pat Kennedy presented an individual who had had electrolysis of an iris cyst with good visual results. Treatment had to be instituted on a second occasion in order to keep the cyst in a collapsed state.

Dr. Paul Chandler gave the Bedell Lecture and stressed the frequency with which the cataractous lens contributed to ocular disease. Dr. Chandler documented the work of the Irvines with clinical experiences and showed that the lens can be harmful to the eye, inducing glaucoma and uveitis. Early removal of the hypermature cataract can prevent the development of glaucoma and cure it sometimes when it already exists. Removal of residual cortical material may save an eye. He stressed the fact that cortical material should be removed when it is considered to be responsible for the resistant uveitis following extracapsular extraction.

Dr. Kelvin Kasper offered his technique for a modified Toti-Mosher operation and the demonstration was accompanied by a film. This pictorial review impressed upon the audience the meticulous nature of Dr. Kasper's approach which probably contributes in a large measure to his high percentage of successful results.

Dr. Shipman demonstrated methods of repair of retinal detachment using a scleral indentation and enfolding based on his considerable experience with extensive retinal detachments that had failed to respond to more conservative measures.

Dr. Annesley and Dr. Kennedy reported on the cases on their service which had undergone vitreous implant for severe retinal detachments; 33 percent of these cases responded. The complications encountered

included cataract, endophthalmitis, and vitreous contraction.

Dr. Gerard M. Shannon provided several methods for repair of lid scars. His discussion was enlightening in that he showed that the proper handling of ectropion, as well as entropion, depended on analysis of why the lid deformity occurred. When properly analyzed, the plastic repair was not difficult and the chances of success increased tremendously.

In his inimitable fashion, Dr. Spaeth described various methods of correction of ptosis and was able to illustrate his techniques on patients by photography.

All those at the conference enjoyed the annual contest presented by Dr. Bedell. Each individual was asked to diagnose a series of Dr. Bedell's fundus photographs. The winner this year was Dr. Belmont.

Mr. John A. Diemand, president of the Board of City Trusts of Philadelphia, was introduced to the assembly as the honored guest.

The entire meeting was enjoyable, enlightening, and entertaining. The technical exhibits were well attended and added considerably to the practical aspects of the program.

The Wills Eye Hospital Society closed the affair with its annual meeting held Saturday night.

Irving H. Leopold.

CORRESPONDENCE

Tests for central scotoma

Editor,

American Journal of Ophthalmology:

Through the courtesy of Dr. Adelbert Fuchs and Dr. Yoshitami Suzuki, I have received a copy of Komoto's *Tests for Central Scotoma* which is indeed ingenious and interesting.

Komoto's tests for central scotoma were revised by Prof. Yaeji Ito of the Tokyo Imperial University and published by the Handaya, Tokyo, 1917. The tests were used extensively to determine central scotomas as found in young adults in Japan suffering from beri-beri and retrobulbar neuritis. The tests consist of eight plates arranged in a booklet, similar to the Ishihari tests, and show radiant dots increasing in diameter as the periphery is reached. A central fixation dot is surrounded by three or four concentric dots of the same size. These extend into the entire periphery but are more appreciable near fixation. An illusion of depth is evident in all of the plates which are printed in black, red, green, yellow, and blue.

Monocular testing is performed and, if the patient sees any deficiency in color or saturation in the center in daylight, it is concluded that a macular lesion is present.

(Signed) Brittain F. Payne,
New York.

BOOK REVIEWS

Surgery in World War II: Ophthalmology and Otolaryngology. Col. John Boyd Coates, Jr. (MC), editor-in-chief; M. Elliott Randolph, M.D., editor for ophthalmology. Washington, D.C., Medical Department, United States Army, Office of the Surgeon General, Department of the Army, 1957. (For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D.C.) Price: $5.00.

Sixteen years after the start of World War II, there has come from the U. S. Government Printing Office the latest volume of the official history of the Medical Department, U. S. Army, in that conflict. It covers ophthalmology and otolaryngology. It is well worth the cost. Only that portion on ophthalmology (400 pages) will be reviewed here.

This book will have many facets for the hundreds of ophthalmologists who have served, and will serve, their country in time of war. First, it is a broad record of what

happened, of the ocular needs of millions of troops, and how those needs were met.

Next, if one will read with care, it is a compilation of the problems and the frustrations faced by all ophthalmologists in service, from Captain to Chief Consultant, problems of instruments and supplies, of commanding officers who were difficult, of placing personnel where they were best suited, of keeping troops supplied with regular and gas-mask glasses, and so on. Now, in peace time, this compilation should become a Bible for the Medical Corps to prepare for the next holocaust, lest all these errors and frustrations be heaped again upon us. It contains many very basic recommendations of the highest importance.

This work is obviously an historical document. Each section briefly alludes to similar experiences and how they were met in World War I. Changes after 25 years, between wars, were tremendous. Someday our successors will look back on this record, probably with much respect for the high quality of medical care provided in World War II.

This is a medical textbook, and a fine one, on certain conditions. It contains monographs based on a wealth of clinical material and experience that cannot be duplicated elsewhere, such as rehabilitation of the blinded, management of intraocular foreign bodies, night blindness in military personnel, and visual disturbances associated with head injuries.

This volume can be a sentimental stimulus to the host of civilian-soldier oculists who, though unnamed, wander through its pages, whether they saw service in the Pacific or Europe or ZI. In retrospect, it will stir admiration over how well the job was done, considering the difficulties. It describes how, repeatedly, effort and ingenuity discovered solutions and produced results that make the reader question whether he himself did his duty in that war, when he reads what others accomplished. For those who served mostly overseas, or entirely at home, it describes in generalities what ophthalmic practice was like for the other fellow. It fills in many gaps which all of us have wondered about, for only in retrospect could the whole picture be put together, as has now been done.

Most of the clinical problems that ophthalmology faced during the war were not peculiar to conflict and are still with us. Frequency and severity were increased, as, for example, in foreign bodies and head injuries. But a long list of problems were administrative. These were distinctly peculiar to war, will face us in another, and most of them will occur in war involving the homefront. It is these which should be studied and solved now, before it is too late. Examples are without end. How can masses of troops be refracted, supplied with glasses and replacement glasses, and each keep a copy of his own prescription? What is the best classification, replacement, and utilization in war time of ophthalmologists, optometrists, and opticians? Are surgical instruments of proper type, quality, and numbers available, instead of the dozens of muscle hooks, manicure scissors, and canaliculus knives that appeared early in the last war? Are portable slitlamps, tonometers, and ample medications available?

This document is well organized and written by some 15 ophthalmologists. Sections, divided into administrative and clinical, are devoted to the Zone of the Interior, the Mediterranean, European, and Pacific Theaters, and then follow 11 chapters on various clinical entities. Statistics and details are largely omitted, or put in an appendix, so reading is easy. It is well printed, with a modest sprinkling of photographs. No typographic errors were noted, and only two others. If anything be lacking it is the names, the places, the personalities, the sounds and smells, the fears and hates and pleasures, all the things that crowd into our memories of an experience that for some was hell, and for few was one they want to repeat. But these were not ophthalmology and must find their place in other volumes. The content is

cool and objective, mostly stripped of emotion and human contact, with seldom a name and rarely any direct criticism.

This book deserves reading by every ophthalmologist who has seen military service or who may ever do so. It constitutes a record of great achievement by civilian ophthalmologists, called to duty and working often against great odds. It is our responsibility today to insure that those odds will be far smaller next time.

Don Marshall.

A System of Ophthalmic Illustration. By Peter Hansell. Springfield, Illinois, Charles C Thomas, 1957. 114 pages, 78 figures, 4 in color, index. Price: $5.75.

It is common knowledge that all ophthalmologists are gadgeteers and that the "gadget" that interests them most is the camera. Indeed, at a congress of ophthalmologists, cameras frequently outnumber the participants and each month's Journal seems to contain another modification of an anterior segment or retinal camera. Even nonenthusiasts use photographic terms constantly in explaining pathology of the retina and transparent media to their patients.

The taking and processing of medical photographs has developed into a painsaking art and there are societies both in England and the United States devoted to biologic photography, each of which publishes a journal well worth perusing. However, there have been few texts devoted solely to ophthalmic photography and Mr. Hansell's book will be welcome to those who would like to keep abreast of current techniques in this field. (An excellent mimeographed monograph by Margaret Markham published in 1951 is not easily available and is perhaps a bit too detailed for the average amateur. It deserves republication in a more elegant format.)

Peter Hansell is particularly well suited to be the author of a system of ophthalmic illustration since he has recently co-authored *An Atlas of Diseases of the Eye* with E. S. Perkins and has for some time been the director of the Department of Photography at The Institute of Ophthalmology in London. To those who cherish their out-of-print "Duke-Elders" no more need be said. The present text is brief (114 pages) yet it covers equipment, materials, motion-picture photography, and such specialized techniques as stereoscopic and retinal photography. Photomicrography is covered in a brief two paragraphs, it being assumed by the author that the reader is familiar with standard photomicrographic technique. (Further texts on photomicrography such as the monograph by Eastman Kodak are readily available at all photographic shops.) One wonders, however, why no mention is made of the newer "instant cameras" (such as the Land-Polaroid) which have been found useful in clinical practice although they are admittedly held in disdain by the professional photographer.

David Shoch.

Contact Lenses. By Theodore E. Obrig, Ph.D., and Philip L. Salvatori. New York, Obrig Laboratories, 1957. Third edition, 780 pages, 197 illustrations, bibliography, and index. Price: $15.00.

The many improvements and variations in contact lenses developed since the war have been accompanied by a marked expansion in their use and a corresponding increase in professional interest. While the first (1942) edition of this monograph contained 470 pages, the present third edition numbers 780 pages! The varied designs of contact glasses are described with objectivity and all information is backed by solid documentation; the last two fifths of the book gives the detailed specifications of the numerous patents (305 pages) and an excellent representative bibliography (29 pages).

The original helmet type of contact glass which required a solution is used today only in special cases, such as extreme keratoconus,

lagophthalmos, and severe corneal scarring. The popular corneal lens and its modification, the microlens, are easy to fit, rarely induce corneal edema, and allow an extended wearing time, but they may excite lid irritation and are easily lost, especially while swimming. Their continued use may cause a loss of corneal sensation (which returns to normal several weeks after their removal), or an erosion of the central corneal epithelium, or a punctate staining of the entire corneal surface. Hence periodic examination is mandatory even though no discomfort is experienced.

The Lacrilens and the similar Invisalens (not mentioned) are nonfluid, corneoscleral types vented to provide lacrimal irrigation. They are custom-made and stay securely in place. The similar Dallos lens of glass performs equally well but takes much more time to fit.

Because of their optical properties contact glasses are more effective than spectacles in keratoconus, irregular astigmatism, high myopia, and high degrees of anisometropia. In simple refractive errors spectacles are more accurate as the fabrication of contact lenses has only an accuracy of 0.01 inch in the radius while optical tolerance demands precision within 0.001 inch. Since minor changes in refraction are probably due to changes of the corneal surface, contact glasses need not be changed in power as often as spectacle lenses. In fitting young persons the power of the contact glass should be checked under cycloplegia—a procedure too seldom used.

The nonoptical uses of contact glasses should be more fully explored. For concealing a disfiguring corneal scar a contact glass with a black pupil is simpler than tattooing and the results are both more cosmetic and more permanent. An appropriately colored contact glass with a clear pupillary area is helpful in albinism and aniridia. As an alternative to surgery, a blind squinting eye can be given a normal appearance with a contact shell.

For 25 years the authors have been devoted to the fitting and development of contact lenses. The many interesting case histories reflect their intense interest in the many aspects of the subject. This edition is certainly the most definitive monograph on contact lenses yet published.

James E. Lebensohn.

PRINCIPLES OF OPHTHALMOSCOPY. By John K. Erbaugh, M.D., Norristown State Hospital, Norristown, Pennsylvania. Springfield, Illinois, Charles C Thomas, 1958. 64 pages. Price: $5.50.

The brevity and incompleteness of this handbook reveal the desire of the author to bring this subject to the attention of the general practitioner rather than the ophthalmologist and, used for that purpose, the book may be recommended. Undoubtedly the physician of today is much more likely to own and occasionally use the ophthalmoscope than was true a generation ago. Any stimulation toward a better understanding and interpretation of fundus findings is therefore to be commended. In simple fashion the author discusses the normal fundus appearance and describes a few of the more important pathologic changes, such as papilledema and optic atrophy and the vascular changes of hypertension, arteriosclerosis, and diabetes. Original drawings are included but the colored fundus plates are borrowed from those published by the American Optical Company.

The size of the disc is overemphasized without reference to the *apparent* size as the result of hyperopia or myopia or distortion resulting from an astigmatic error. No mention is made of indirect ophthalmoscopy, a method which has become almost a lost art even in many ophthalmic centers in America. In spite of these defects, as seen from a purely specialized view point, this small book can be recommended for the general practitioner who wishes to blow the dust off of his ophthalmoscope, review the sub-

ject, and add this important instrument to his active diagnostic armamentarium.

William A. Mann.

THE CAUSES AND PREVENTION OF ACQUIRED MYOPIA. By Tikasi Sato, M.D. Tokyo, Kanehara Shuppan Co., 1957. 244 pages, 35 figures, bibliography, index. Price: Not listed.

Professor Ishihara maintained that the near work involved in studying the minimum of 2,000 ideograms essential for literacy contributed to the high incidence of myopia among the Chinese and Japanese, and zealously championed the substitution of an alphabet similar to that in the Romance languages. In 1939 he inspired the studies in myopia that Tikasi Sato has diligently continued since. The author is not to be confused with Tutomu Sato, a frequent contributor to THE JOURNAL, who has been keenly interested in the same subject and has experimented with a new surgical approach to myopia (Am. J. Ophth., **36**:823, 1953).

Tikasi Sato holds that "The post-natal cause of school myopia is not the elongation of the ocular axis produced post-natally through near work but is caused by a post-natal change in the refractive power of the crystalline lens which is related to the continuous accommodation caused by near work." He claims that accommodation in susceptible individuals raises the tonus of the ciliary muscle and changes the shape of the crystalline lens. In his studies he found that the instillation of one-percent atropine once daily for three days removed completely the tonus of the ciliary muscle, and demonstrated that the refractions in cases of accommodative paralysis caused by diphtheria and that found by atropine after recovery were identical.

Sato presented his views at the last International Congress of Ophthalmology (Acta XVII Conc. Ophth., **3**:1819-1830, 1954). In the discussion Lindner pointed out that in Germany myopia among printers is no more frequent than in bricklayers, and that in Egypt the illiterate peasants have a very high incidence of myopia. Constitutional remedies for myopia, ignored by Sato, were suggested by Beaumont of New Zealand and Arthur Knapp of New York. It seems significant that the Japanese diet like that of the Chinese is markedly deficient in B-complex vitamins.

The book is written in good English and is well printed. A textual error was noted on page 34 where he cites data from the clinics of the "Chicago City Hospital" when it should be "of the University of Chicago."

James E. Lebensohn.

A CONTRIBUTION TO CREDÉ'S PROPHYLAXIS OF BLENNORRHEA IN NEWBORN. By H. Salvisberg and F. Schönenberger. Basel, New York, S. Karger, 1957. 47 pages. Price: S Fr. 7.50.

In the first page of this monograph, Salvisberg gives a historical review of Credé's method using silver nitrate in the prophylaxis of blennorrhea in newborn. He discusses disadvantages of its use and evaluates recent attempts to substitute other newer drugs for silver nitrate or to discontinue prophylactic measures altogether.

Gonococci have ceased to be the most important cause numerically of blennorrhea in recent years; staphylococci, various bacteria, and the virus of inclusion blennorrhea actually occur more frequently than the former. The ideal prophylacticum should be effective in every instance. Colloidal silver preparations, though still widely used (especially in Switzerland), have proved to be completely unsatisfactory.

With the advent of the sulfonamides, a substitute seemed to be at hand that was equally effective and less irritating than silver nitrate. Recently sulfonamides have lost favor with most men because of numerous allergic reactions after their use in newborn and because a number of strains, es-

pecially gonococci, have become increasingly resistant to them.

Penicillin seems to possess definite advantages over silver nitrate: it is less irritating and more reliable—at least in cases of Neiserian infections. However, there has been a steady increase in penicillin-resistant strains of staphylococci. In addition, there is the ever-present danger of sensitizing newborn to penicillin.

In view of the marked decrease of gonorrhea, there have been advocates for a complete discontinuance of prophylactic measures. Such an attitude seems to be overly optimistic. In one report on 665 children not receiving any form of prophylactic treatment, 45 percent showed signs of inflammation, 26.5 percent being of a severe mucopurulent nature.

The author sent questionnaires to 54 European clinics requesting information on their experience and current procedure regarding prophylactic measures. From the 34 replies, he concluded that institutes in Switzerland favored colloidal silver preparations, whereas Scandinavian countries preferred the original Credé method. The German clinics seemed to be inclined to use penicillin, especially in an oily vehicle. It is interesting to note that in these 34 clinics there were only 11 cases of gonorrheic blennorrhea among 48 mothers with gonorrhea.

In the second part, Schönenberger makes a preliminary report on his experience with the prophylactic use of Desogen (Geigy). This is a quarternary ammonium base (methyl-phenyl-dodecyl-trimethyl-ammonium-oxy-methyl-sulfate). It is a disinfectant that has been used extensively by surgeons, dentists, and dermatologists, just to name a few. It is effective against gram-positive cocci, gonococci, Escherichia coli, and proteus. In a concentration of 0.5 percent it causes little or no irritation of the conjunctival sac.

One-hundred-thirty newborn received a drop of the 0.5-percent Desogen solution in each eye. After 18 to 30 hours, smears and cultures did not reveal any bacteria. After the trial series, this solution was used routinely on 310 newborn in the obstetrics clinic in Basel. There was only one instance of mucopurulent discharge; this was in a case of congenital dacryostenosis. After probing the lacrimal passages and instillation of Desogen every two to three hours, no bacteria could be demonstrated 24 hours later.

Stefan Van Wien.

ABSTRACT DEPARTMENT

EDITED BY DR. F. HERBERT HAESSLER

Abstracts are classified under the divisions listed below. It must be remembered that any given paper may belong to several divisions of ophthalmology, although here it is mentioned only in one. Not all of the headings will necessarily be found in any one issue of the Journal.

CLASSIFICATION

1. Anatomy, embryology, and comparative ophthalmology
2. General pathology, bacteriology, immunology
3. Vegetative physiology, biochemistry, pharmacology, toxicology
4. Physiologic optics, refraction, color vision
5. Diagnosis and therapy
6. Ocular motility
7. Conjunctiva, cornea, sclera
8. Uvea, sympathetic disease, aqueous
9. Glaucoma and ocular tension
10. Crystalline lens
11. Retina and vitreous
12. Optic nerve and chiasm
13. Neuro-ophthalmology
14. Eyeball, orbit, sinuses
15. Eyelids, lacrimal apparatus
16. Tumors
17. Injuries
18. Systemic disease and parasites
19. Congenital deformities, heredity
20. Hygiene, sociology, education, and history

1

ANATOMY, EMBRYOLOGY, AND COMPARATIVE OPHTHALMOLOGY

Erskine, C. A. **Capillary-glia relationships in the human optic nerve, chiasma, and tract, as shown by phase-colour contrast and microdissection.** Brit. J. Ophth. **42**:81-90, Feb., 1958.

The capillary-glia relationships in the normal optic nerve and tract were studied by means of microdissection and a new phase-color contrast optical arrangement. Glial elements were found separating the capillaries from the nerve fibers in all instances and in all areas. (14 figures, 9 references) Lawrence L. Garner.

François, J., Neetens, A. and Collette, J. M. **Vascularization of the primary optic pathways.** Brit. J. Ophth. **42**:65-80, Feb., 1958.

A very thorough study of both macroscopic and microscopic vascularization patterns is reported. Microradiographic examinations are made possible by using thorotrast in the vessels. (18 figures, 2 tables, 8 references)

Lawrence L. Garner.

Huggert, A. **An experiment in determining the pore-size distribution to the filtration angle of the eye. Part II.** Acta ophth. **35**:104-112, 1957.

A series of eyes, mainly from cattle, was examined by means of perfusion with isobutyl alcohol. The results support the hypothesis that the number of pores with a diameter larger than 1.0 is relatively small, that of smaller pores very large. The pore-size distribution curve is displaced towards smaller diameters with increasing age. (9 figures, 1 table, 15 references) John J. Stern.

Pau, Hans. **The development of vitreous and zonule.** Ophthalmologica **134**: 320-331, Nov. 1957.

According to the most widely held view the vitreous develops by a process of a secondary avascular structure becoming wrapped around a primary vascular vitreous. The author's observations on well preserved human embryos suggest a slightly different course of events: the permanent structures, that is the wavy membranes in vitreous as well as the zonule, develop around the individual vessels of the primary vitreous and there-

by preserve rather than envelop the earlier embryonic structure. (17 figures, 30 references) Peter C. Kronfeld.

Zagora, Edward. **The biological evolution of the organ of sight and of the oculo-motor system.** Ophthalmologica **134**:193-200, Sept., 1957.

After some general remarks about the evolution of the organs of sense in animals the author reports on "a study of 50 human embryos which has shown that eye movements probably appear already during embryonic life. The primary stimuli for these movements may arise from the gravistatic labyrinthine mechanism and from the proprioceptive stretch receptors in the neck muscles." What the author seems to have observed are rather marked variations in the relative position of the eyes in human embryos. The source of the material and the condition under which it was obtained, are not stated. (3 figures, 5 references)

Peter C. Kronfeld.

2

GENERAL PATHOLOGY, BACTERIOLOGY, IMMUNOLOGY

Bietti, G. B. and Pannarale, M. R. **Existence of antigenic affinity between agents of trachoma and those of venereal lymphogranuloma-psittacosis.** Wld. Hlth. Org. Bull. **16**:1041-1043, 1957.

A trachoma antigen prepared from conjunctival scrapings was used in complement-fixation tests with sera from cases of lymphogranuloma and ornithosis-psittacosis. A definite antigenic relationship was demonstrated and an almost consistently positive reaction obtained. (1 table, 3 references)

Edward U. Murphy.

Doane, F., Rhodes, A. J. and Ormsby, H. L. **Virological infections of the conjunctiva, Toronto, 1955-56.** Canad. M. A. J. **77**:675-679, Oct. 1, 1957.

In 56 cases of conjunctivitis, 33 adenovirus strains were isolated from eye washings. They were predominantly of Types 3 and 7, but Types 2 and 9 were also found. Serologic tests were carried out on 15 of these patients and a significant rise in both neutralizing and complement fixing antibody levels demonstrated in 12. (2 tables, 19 references)

Edward U. Murphy.

Gemolotto, G. **Vitamine B_{12} in experimental anaphylactic uveitis.** Arch. di ottal. **61**:226-231, May-June, 1957.

Experimental anaphylactic uveitis in rabbits due to horse serum was considerably relieved by the administration of vitamine B_{12}. (4 figures, 2 photographs in color) Paul W. Miles.

Schlossman, S. and Stetson, C. A. **Vascularization of the cornea during delayed hypersensitivity reactions.** J. Immunol. **79**:208-211, Sept., 1857.

Intracorneal injections were performed on normal guinea pigs and those with induced delayed hypersensitivity to ovalbumin. Half of each group were injected with Ringer's solution and the others with a solution of ovalbumin. The animals were killed at varying time intervals and their corneas examined microscopically for evidence of vascularization. Superficial vascularization was found in every eye, and although it was more pronounced and appeared earlier in the hypersensitive group receiving ovalbumin, it was also found in all animals which were given simple Ringer's solution within six hours after the injection. Because of the rapidity with which these capillaries were noted it seems possible that specific channels may be present in the normal cornea which become patent only in response to trauma. This experiment shows that the corneal reaction of delayed hypersensitivity in guinea pigs does not occur in avascular tissue as has been previously

stated, and therefore it is postulated that the blood vessels may participate in this immunologic reaction as they do in others. (1 table, 2 figures, 14 references)

William S. Hagler.

Tanaka, Chie. **The agar-diffusion technique in studies of immunity to adenoviruses.** A.M.A. Arch. Ophth. **58**:850-856, Dec., 1957.

By the agar-diffusion technique, precipitating group specific antibodies to some types of adenoviruses have been demonstrated. Increase in antibodies was found in clinical epidemic keratoconjunctivitis. (2 figures, 2 tables, 13 references)

G. S. Tyner.

3

VEGETATIVE PHYSIOLOGY, BIOCHEMISTRY, PHARMACOLOGY, TOXICOLOGY

Anseth, A. and Dohlman, C. **Influence of the intraocular pressure on hydration of the corneal stroma.** Acta ophth. **35**:85-90, 1957.

The influence of the intraocular pressure on the water-binding of the corneal stroma was studied in experiments on isolated stromas of bovine corneas. The fact that endothelial damage causes considerable corneal swelling, whereas epithelial damage has a lesser effect, was explained on a physical basis. The intraocular pressure counteracts the corneal imbibition of tear fluid, but not of aqueous humor, and it was found that this hydrostatic pressure effect is probably responsible for the difference in swelling after removal of the epithelium and the endothelium, respectively. (3 figures, 3 references)

John J. Stern.

Bech, Knud. **The basophilic substances in the retinal ganglion cells and the physiological activity changes in these cells. (An experimental histological study).** Acta ophth. Suppl. 46, 1957.

Einarson's gallocyanin-chromalum staining allows the distinction of different morphological types of nerve cells: the chromoneutral, moderately and extremely chromophilic, and the moderately and extremely chromophobic varieties. The classical Nissl stain does not permit these differentiations. The Einarson stain has been used in this investigation to give a histologic description of the nerve cells of the ganglionic layer of the retina and to study the changes occurring in their basophilic substances under physiologic conditions.

Chapters I to III review previous studies of anatomy and histology of the retina and the attempts to classify the nerve cells of the ganglionic layers. Chapter IV gives a detailed description of Einarson's staining technique. Chapter V describes the material (rabbits, not albino), and the experimental arrangement: groups of animals were kept in darkness or daylight for various periods of time, were killed and the eyes were fixed in Carnoy's solution; the histologic and microphotographic techniques are described. Chapter VI describes the normal anatomy of the nerve cells based on the picture produced by the gallocyanin-chromalum stain. The cells are divided into three types on the basis of size and distribution of stained structures. In all cells there is a widely varying content of basophilic substance, which is evidence of various stages of activity. Chapter VII discusses the changes in the ganglion cells caused by various degrees of stimulation by light. The highly variable results obtained by various observers are ascribed to inadequate staining techniques and to insufficient knowledge of the anatomic conditions. Chapters VIII and IX discuss the technique of photometric measurements of stained sections, the apparatus used and the method of calculation. Chapter X presents the results of the experiments. No change occurs in the content of nucleic acid in the retinal ganglion cells of ani-

mals which have been kept in darkness for at least 24 hours; statistically significant differences are revealed when the eye is exposed to light. Chapter XI reviews previous studies in which Einarson's stain has been used and compares them with the present results. Some ribonuclease experiments are reported which show that differences in the nucleic acid content of cells can be made visible in sections by staining with gallocyanin-chromalum. Chapter XII reports the conclusions from the measurements performed. 1. After 24 hours in darkness the retinal nerve cells are in a state of stationary rest and 2. the same form of metabolism of nucleic acid occurs in nerve cells under physiologic conditions and in experiments with stress, but under physiologic conditions the processes are so weak that a very sensitive apparatus for measurement is required to demonstrate these metabolic processes. During prolonged stimulation it was found that the content of nucleic acid adjusts itself to a level which is higher than that observed in animals kept in darkness but lower than the one observed after short stimulation. This proves that it is the impulse which reaches the nerve cells in the retinal ganglionic layer that produces the changes in the synthesis of nucleic acid. (26 figures, 1 table, 113 references) John J. Stern.

Brini, A. **The trabecular meshwork of the angle of the anterior chamber.** Ann. d'ocul. **190**:755-777, Oct., 1957.

The author reviews the normal anatomy of the trabecular meshwork. He quotes Ashton's figures of 120 microns as the thickness of the whole meshwork, 5 microns as the thickness of each fiber and 0.5 micron the average distance between fibers. He then describes the histochemical structure of human and calf eyes. He confirms the presence of a hyaluronidase-sensitive substance in the trabecular connective tissue. It appears to be an acid mucopolysaccharide similar to hyaluronic acid.

One must postulate that two substances are present in aqueous humor: one which depolymerizes the mucopolysaccharides (perhaps ascorbic acid or a hyaluronidase as shown only by K. Meyer) and a second which repolymerizes this substance. This may be hyaluronic acid. In any case there are still many lacunae present in this theory which need filling. (5 figures, 50 references) David Shoch.

Cadenas Ugidos, D. C. **The action of sodium propionate in ophthalmology.** Arch. Soc. oftal. hispano-am. **17**:747-767, July, 1957.

A detailed description of the chemical and physiologic properties of sodium propionate, a review of its clinical application alone or in combination with other medicaments in ophthalmology, and a detailed analysis of the results in the author's 132 cases of various conjunctival and corneal affections are presented. The author concludes that the drug has a very limited usefulness in ophthalmology. It is inferior to antibiotics, and cannot replace any one of them. In spite of its brief duration the disagreeable sensation of burning, lacrimation and photophobia associated with its instillation frequently results in a discontinuance of its application by patients. Eczema and palpebral edema frequently appear after four or five days. It can be used in conjunction with antibiotics, particularly in chronic inflammations with a mycotic component in their etiology. (9 tables, 14 references) Ray K. Daily.

DeBerardinis, E. **Observations on the aqueous-serum osmotic tension in some species of animals.** Arch. di ottal. **61**:273-277, May-June, 1957.

Tests showed hyperosmotic tension of the aqueous over serum of about 2 mM. Differences in guinea pigs were attributed

to deficiency of bicarbonate and chloride in their aqueous. Paul W. Miles.

DeBerardinis, E. and Gaipa, M. **The effect of iodoacetate in rabbits to change the histology of the ciliary body and to modify the nucleic acids in the retina and uvea.** Arch. di ottal. **61**:260-266, May-June, 1957.

Administration of iodoacetate in rabbits caused atrophy of the internal epithelial layer of the ciliary processes. It decreased RNA (ribonucleic acid) after 3 to 18 hours while increasing desoxy-ribonucleic acid in the retina, anterior uvea, and choroid. The exact amounts found in the controls, and in animals three hours, 18 hours, and five days after administration of iodoacetate were tabulated. (1 figure, 1 table) Paul W. Miles.

D'Esposito, M. **Effect of ACTH on retinal metabolism.** Gior. ital. oftal. **10**:57-66, Jan-Feb., 1957.

The effect of ACTH on the retina was studied in rabbits. It was found to lessen the oxygen consumption of the retina and to have no effect on the aerobic glycolysis. (4 tables, 50 references) V. Tabone.

Dohlman, C. H. **Incorporation of radioactive sulfate into the rabbit eye.** Acta ophth. **35**:115-130, 1957.

The uptake of S^{35}-labeled sodium sulfate in the rabbit eye was studied by means of autoradiography and by assay of radioactivity in separate ocular tissues. A time-relation study showed the turnover rate of total S^{35} to be rapid in the sclera, uvea, vitreous and retina, slow in the cornea and particularly slow in the lens. A more detailed autoradiographic study was performed three days after 20mC of S^{35}-sulfate was injected. The cornea and sclera, rich in sulfomucopolysaccharides, showed a high uptake. Higher S^{35} incorporation in the inner layers of these coats indicates that the supply of electrolytes is maintained mainly from aqueous and choroid. A small percentage of the corneal radioactivity was found in the epithelium and the endothelium. Also the uveal tract, especially the ciliary body, and the optic nerve sheaths incorporated radiosulfate. The lens borders, the retina and the nervous elements of the optic nerve demonstrated a slight uptake. The chemical distribution of S^{35} between inorganic sulfate, ester sulfate and organic nonsulfate sulfur was investigated in various tissues of the eye 3, 17 and 43 days after isotope administration. The majority of the S^{35} in the cornea and sclera occurred in sulfomucopolysaccharides. The turnover rate of mucopolysaccharide-S^{35} was probably higher in the sclera than in the cornea. Some nonsulfate labeled sulfur existed in all tissues investigated, and in high percentage in the lens. Cystine and methionine together contributed about 40 per cent of the nonsulfate S^{35} in the cornea. (7 figures, 4 tables, 31 references) John J. Stern.

Dohlman, C. and Anseth, A. **The swelling pressure of the ox corneal stroma.** Acta ophth. **35**:73-84, 1957.

The swelling pressure of the ox corneal stroma and sclera was measured by dialysis against Krebs-Ringer solution containing high-molecular dextran in increasing concentrations. The swelling or dehydration of the tissue was measured by weighing. The colloid-osmotic pressure of the dextran solutions and of ox serum was determined by osmometry.

The swelling pressure of the freshly excised bovine stroma was found to be about 865 mm. H_2O. The metabolism of the stroma cells does not seem to play any role in the hydration of the isolated stroma. It is suggested that a great part of the swelling might be caused by the Donnan effect.

The isolated sclera was found to have a swelling pressure of about 325 mm. H_2O and the measurements of the colloid-osmotic pressure of bovine serum averaged 340 mm. H_2O. Thus the swelling pressure of the cornea seems to exceed that of the sclera and blood plasma by at least 500 mm. H_2O. This indicates the existence of a dehydrating mechanism which constantly prevents the cornea from swelling. The physiologic significance of this concept is discussed. (3 figures, 3 tables, 14 references) John J. Stern.

Drischel, H. **Experiments on the light reflex of the human pupil after brief stimulation.** Klin. Monatsbl. f. Augenh. **131**: 740-755, 1957.

A modified pupillography is used. The duration of the stimulus was 1/100 second. Hyperkinetic and hypokinetic pupillograms were found in addition to the usual normokinetic reaction. The influence of some autonomic drugs is mentioned. (9 figures, 2 tables, 26 references) Frederick C. Blodi.

Gerber, Margaret. **Disturbances of vision caused by digitalis preparations.** Am. Geriat. Soc. J. **5**:668-670, July, 1957.

Of patients with digitalis intoxication 25 percent are said to experience visual symptoms which may or may not precede the other signs of intoxication. Disturbances in color sensation are the most common ocular sign, and objects may appear to be yellow, green, blue, or red. Light flickerings, dimness of vision, scotomata, conjunctivitis, visual hallucinations, nystagmus, mydriasis, and exophthalmos have all been described previously. No satisfactory explanation for these phenomena has ever been advanced.

Two patients are presented in whom bilateral retrobulbar optic neuritis developed while on gitalin and digitoxin respectively. Both had central scotomata with normal fundi and no other ocular abnormalities. In the first patient the ocular symptoms preceded the cardiac signs of intoxication, while in the second no other effects of intoxication were ever noted. The optic neuritis cleared completely in both within 30 days in the first, and within 21 in the second. (11 references) William S. Hagler.

Hong, S.-M., Cibis, P.A. and Constant, M. **Effects of iodoacetic acid on ocular inflammatory responses.** A.M.A. Arch. Ophth. **58**:632-640, Nov., 1957.

Previous studies have shown that the effects of ionizing radiation and the systemic administration of iodoacetic acid produce similar ocular lesions. However, it is known that ionizing radiation produces primarily a leucocytic response in the lesion, whereas iodoacetic acid produces an erythrocytic response. These studies were carried out as an attempt to explain this difference in response, but were not conclusive. However, the authors were able to infer that iodoacetic acid exerts a direct inhibiting effect on the leucocytes in the blood since local application of the drug did not prevent leucocytic infiltration in turpentine corneal lesions. (9 figures, 6 tables, 12 references) G. S. Tyner.

Ibragimova, V. **Leukoderma and graying of hair due to Furacilin.** Vestnik oftal. **6**:28-32, Nov.-Dec., 1957.

In three young Chinese patients who had used Furacilin drops for palpebral and conjunctival infection from six months to three years, the skin of the lids became depigmented. The cilia were not discolored.

Experimentally Furacilin ointment was massaged into the skin of rabbits and guinea pigs and in others an alcoholic solution was applied to a shaved area for 8 to 15 days. In all animals the fur and skin became discolored, but the animals regained the color and the fur became nor-

mal when the applications were discontinued. In a series of animals with graying fur a biopsy was taken and it was found that pigment cells in the derma were atrophied. The fur of the animals was placed in an alcohol solution of Furacilin for three weeks, then in a thermostat for three weeks, but no graying of the hair resulted. Furacilin was introduced into animals intravenously and also into the stomach but there was no discoloration of the skin.

A Japanese dermatologist, who used guanofuracin, observed vitiligo of the lids in 29 patients who instilled it into the eyes. He presumed that the preparation acts on the pigment metabolism through the nerve endings. (References)

Olga Sitchevska.

Kuriyama, H. A. and Jojima, T. **Na and K contents of retina of toad and electroretinogram.** Japanese J. Physiol. 7:241-251, July 30, 1957.

The intracellular contents of Na and K of the retina of the Japanese toad (Bufo vulgaris) were determined by a combined use of flame photometry and the inulin space method. The action potentials were led off with Pt-electrode or microelectrode. The amount of Na and K in the retina and their changes under various conditions were studied, comparing them with ERGs.

The intracellular Na and K contents of the retina of the normal toad were 57.2 mEq/kg. of fresh tissue excluding extracellular fluid and 63.1 mEq/kg. respectively. These are the mean values obtained from 98 toads in January and February.

Na and K contents were in a better state of balance when the Ringer's solution contained glucose and sodium L-glutamate than when it contained glucose alone or no substrate, though the difference was not very marked and there was no difference in the effect on the ERG.

Some new information was gained from a comparative study of the changes produced in the intracellular Na and K contents of the retina and those in the ERGs, more particularly in the magnitude of b-waves, when the retina was incubated in a medium containing a chemical agent considered to have a direct or indirect effect on the content. (7 figures, 5 tables, 28 references) Authors' summary.

Merz, Marian. **Visual apparatus and pituitary-hypothalamic system.** Klinika Oczna 27:629-636, 1957.

The visual organs are co-ordinated with the pituitary gland by two sets of reflexes, one is opticopigmentary, the other opticosexual. The relations with the hypothalamus are much more complex. Paths leading toward various nuclei of the hypothalamus and from them are described. The physiologic function of the hypothalamo-pituitary system is discussed. The author states that each disease has its somatic and psychic component. Reaction of each organ to a psychic stimulus depends on its structure and is expressed in contraction and secretion. The visual organs are affected by psychic stimuli producing first, functional disorders, and later organic ones, but also diseases of the visual organs may result in psychologic disturbances. Glaucoma is given as an example where the influence of the hypothalamus can be demonstrated by experiment. (1 figure, 40 references)

Sylvan Brandon.

Santino, D. **Effect of Adaptinol on retinal sensitivity to light.** Gior. ital. oftal. 10:51-56, Jan.-Feb., 1957.

Experiments on 12 persons with amblyopia of one eye showed 1. that Adaptinol (a carotene derivative, Bayer) lowered the threshold for light sensitivity and 2. that the light threshold of both normal and amblyopic eyes was equal and reacted equally to Adaptinol. (2 graphs, 14 references) V. Tabone.

Scardi, V. and DeBerardinis, E. **Electrophoretic behavior on paper of soluble retinal proteins by ionic force.** Arch. di ottal. **61**:233-240, May-June, 1957.

Fresh beef retinas were placed in an extracting solution and ground in a mortar. Nonsoluble matter was removed by centrifuge. Paper electrophoresis was continued for 24 hours. When the extracting solution contained veronal and veronal sodium, with boric-KCl-NaOH buffered to pH 8.5-8.7, the proteins amounted to 2.25 to 2.35 grams per 100 ml. With extracting solution of NaCl .15 M, and saccharose .25 M, 1.25 to 1.53 g/100 ml was obtained. Four protein fractions were found and their significance is discussed.

Paul W. Miles.

Schenk, H. and Trichtel, F. **The effect of trypsin upon the absorption of hyphemas: an experimental study.** Ophthalmologica **134**:396-401, Dec., 1957.

Hyphemas were produced in rabbits by replacing the aqueous with the animal's own venous blood. In one series of experiments the erythrocytes were tagged with P^{32} before injection into the anterior chamber. The rate of disappearance of this blood from the anterior chamber was observed clinically, photographically, and with a Geiger counter. A preparation of synthetic trypsin in sesame oil was given to some of the animals by intramuscular injection. The rate of absorption of the hyphema was not significantly accelerated by the trypsin therapy. (2 figures, 13 references) Peter C. Kronfeld.

Segal, P., Ruszkowski, M. and Wilk-Wilczynska, M. **Electrophoretic investigations of aqueous in uveitis.** Klinika Oczna **27**:563-576, 1957.

Aqueous from 43 patients was examined by electrophoresis, in some of them twice, bringing the number of aqueous samples to 60. Four individuals without uveitis served as controls. The primary aqueous did not contain enough protein to be useful, the secondary was similar to blood serum. Tests showed that aqueous collected from cases of uveitis had its origin in the blood serum, and differed from it only slightly. In acute rheumatic uveitis the blood serum showed lowering of albumin concentration and increase of alpha and gamma globulins. In very severe cases aqueous proteins were identical with those of the serum. Increase and decrease of albumin was found in various groups of patients. The authors try to explain this seemingly contradictory result by the behavior of the blood-aqueous barrier in inflammatory conditions. In chronic uveitis fractions of aqueous proteins resemble transudate. In advanced glaucoma albumin and alpha globulin factors were increased and globulin was decreased. The authors feel that electrophoretic tests of the aqueous should be added to cytologic, bacteriologic and immunologic tests in order to obtain a full picture of the aqueous change in uveitis. (2 figures, 12 tables, 12 references)

Sylvan Brandon.

Wald, G. and Brown, P. K. **Human rhodopsin.** Science **127**:222-226, Jan. 31, 1957.

Human rhodopsin in aqueous solution has λ max. of 493 mμ and is lower in the spectrum than the rhodopsins of all other known vertebrates, with the exception of certain deep-sea fishes. Its molar extinction is 40,000 $\pm$ 800. Like other rhodopsins, it bleaches to a mixture of opsin and all-trans retinene and is resynthesized by incubating opsin with neo-b (11-cis) retinene. The regenerated rhodopsin has the same λ max. as the extracted pigment; this is due, therefore, not to an unusual retinene but to a characteristic human opsin. The regeneration in solution from opsin and neo-b retinene is a second-order reaction with a half-time, at 29.5°C, of about 2.5 minutes. This is much faster than the synthesis of rhodopsin in the living human eye, and faster than human

rod dark adaptation; the rate of both processes in vivo must be limited by reactions which precede the union of neo-b retinene with opsin, the final step in rhodopsin synthesis. In the rods, rhodopsin is virtually in the solid state—highly oriented in close relation with other highly oriented molecules. In this situation its spectrum is displaced toward the red (λ max. 500 mμ) and is narrower than in solution. For light entering the rods axially, rhodopsin has also a considerably increased extinction, some 1.5 times higher than when randomly oriented. The spectrum of rhodopsin in rods agrees well in form and position with the spectral sensitivity of human rod vision, measured at the retinal surface. (6 figures, 1 table, 20 references) Authors' summary.

Wudka, E. and Leopold, I. H. **Experimental studies of the choroidal vessels.** A.M.A. Arch. Ophth. **58**:710-724, Nov., 1957.

This is part of a study of the hemodynamic characteristics of the choroidal circulation in living albino rabbits. Several interesting observations are made which have clinical application. With increasing intraocular pressure there is a compensatory change in the choroidal circulation. The pressure increase is transmitted to the veins which, in turn, affect the capillaries and then the arteries. Circulation is then established at a higher level. If there is further increase in ocular pressure the process repeats itself until the available force from the arteries is exhausted. No active or passive dilatation of choroidal vessels could be noted. (1 figure, 99 references) G. S. Tyner.

4

PHYSIOLOGIC OPTICS, REFRACTION, COLOR VISION

van Albada, L. E. W. **Stereotronic radiation. A concept of distance perception.** Acta ophth. **35**:196-199, 1957.

The author presents a concept of a new type of radiation emitted by illuminated objects as a possible explanation for some of the puzzling phenomena of distance perception. The intensity of the rays at any point depends upon the distance from the source. The effect of this radiation on the retina is to cause a passive sensation of distance, apart from but in conjunction with the ordinary optic image. (1 reference) Ray K. Daily.

Belostotsky, E. and Friedman, F. **The treatment of amblyopia in false light fixation.** Vestnik oftal. **6**:18-23, Nov.-Dec., 1957.

In 40 patients, aged from 7 to 18 years, previously treated from one to ten years without results, this new method of Cüppers for the treatment of amblyopia with false fixation was used. In 39 patients there was hypermetropia or hypermetropic astigmatism of one to seven diopters. In 33 patients central fixation was obtained, in 36 patients the vision was improved. In patients with 35 degrees of strabismus an operation should precede the training. (5 figures, 2 tables, references) Olga Sitchevska.

Colenbrander, M. C. **Optical aids in non-optical abnormalities of the eye.** Ophthalmologica **134**:359-363, Nov., 1957.

The most practical visual aid, in the author's experience, is a loupe held by hand and adjusted to the changing visual needs, combined with a strong reading addition (+4D) in a regular spectacle frame. Peter C. Kronfeld.

Craig, Paul C. **A temporary lens for aphakia.** A.M.A. Arch. Ophth. **58**:751, Nov., 1957.

The lens is ground so that it is placed on the patient's old glasses with scotch tape. It is 30 mm. in diameter and has a proximal curve of −6.00 and a distal curve of +18 with a paper-thin edge. G. S. Tyner.

ten Doesschate, G. and ten Doesschate, J. **The influence of the state of adaptation on the resting potential of the human eye.** Ophthalmologica **134**:183-193, Sept., 1957.

This is the authors' second study concerning the relationship between the amplitude of the electro-oculogram (EOG) and the state of adaptation. The earlier study (Ophthalmologica 132:308, 1956) had shown a decrease in the amplitude of the EOG during dark adaptation and an increase during light adaptation, but gross differences in the time course of the two phenomena.

In the present study the influence of the preadapting light was investigated more closely. Besides, an opportunity presented itself for studying the problem on a "simplified" visual system, that is, a patient with congenital idiopathic night-blindness. The new results show a good correlation between EOG and the nervous (not the photochemical) component of adaptation. (7 figures, 16 references)

Peter C. Kronfeld.

François, J. and Verriest, G. **The acquired dyschromatopsias. (Part I.)** Ann. d'ocul. **190**:713-746, Oct., 1957.

This is the first of three articles on acquired dyschromatopsias with which the authors hope to establish the diagnostic value of studying defective color vision as part of the routine of functional examination of the eye. An introductory section reviews normal color vision, congenital dyschromatopsia and acquired dyschromatopsia. (The latter is subdivided into red-green defects, blue-yellow defects, chromatopsia, achromatopsia and post-occipital color perception difficulties.)

This introductory section is followed by a description of the methods of examination used. There are six such methods: the Atlas of Ishihara, The Atlas of Polack, The Tritan—Plate of Fransworth, the D-15 panel (Farnsworth dichotomous plate), The 100-Hue test (Farnsworth-Munsell) and finally the Nagel anomaloscope. The usefulness of each method is evaluated and its limitations noted. (5 figures, 10 tables) David Shoch.

François, J. and Verriest, G. **The acquired dyschromatopsias (continued).** Ann. d'ocul. **190**:812-859, Nov., 1957.

This is part II of a three-part article that began in the October, 1957 issue. The authors continue their exposition of the methods used in the study. Subjective examination of the spectrum is done with a von Helmholtz color-mixing apparatus although the Nagel anomaloscope (Model II) may also be used.

In the following section equations are developed to relate a variable wave-length to mixtures of two constant wave-lengths. Finally the technique of perimetric and ERG examination is given. The concluding portion of Part II is an analytical study of various clinical pathologic entities. Diseases of the refractory apparatus are considered first. Color vision of aphakic subjects is always abnormal, the perception of short waves being supranormal (in contrast to patients with cataracts where perception of blues and violets is almost nil). Then congenital aberrations and abiotrophies are discussed, e.g. tapeto-retinal degenerations (peripheral and central), senile macular degenerations, siderosis, and malignant myopia, retinal detachments and chorioretinitis. Each entity is illustrated by personal cases of the authors which illustrate the type of dyschromatopsia present. (22 figures, 4 tables) David Shoch.

François, J. and Verriest, G. **Classification and symptomatology of the acquired dyschromatopsias.** Bull. Soc. belge d'opht. **116**:351-395, 1957.

Acquired dyschromatopsias cannot be compared with congenital dyschromatopsias because the former affect the whole spectrum, the latter one part of the spec-

trum only. The main part of this work comprises a report on 150 persons with various ocular disorders. All of them were carefully investigated. Normal color perception was found in functional anomalies, in specific types of tapetoretinal degenerations, in senile pigment degenerations and in vascular disease of milder degree and various etiology. Red-green anomalies were found in peripheral chorioretinal diseases and abiotrophies, senile degenerations of the macula and certain types of optic atrophy. Blue-yellow anomalies were seen in retinitis pigmentosa and related retinopathies, retinal detachment, severe diabetic and hypertensive retinopathy, occlusive vascular retinal disease, glaucoma, and hereditary optic atrophy. Specific color disturbances were noticed in the presence of cataract and serous retinopathy. This work also includes a short review of normal color vision, of the characteristics of congenital anomalies and a classification of congenital and acquired dyschromatopsias. A short analytical study of color perception tests in various abnormal ocular conditions represents another valuable contribution and serves as evidence for the diagnostic importance of color vision investigation among other functional tests. The methods of examination and the equipment preferred by the authors are described in detail. (10 figures) Alice R. Deutsch.

Granger, G. W. **Light and form thresholds during dark adaptation.** Acta ophth. **35**:361-371, 1957.

Reference is made to the different opinions held by Pirenne and associates and Chapanis on the relation of light sensitivity to form perception. Pirenne, Mariotte, and O'Doherty hold that there is a close relationship between the two functions, while Chapanis and others believe that they differ significantly. The author used ten subjects between 19 and 22 years of age with normal eyes; after a preliminary dark adaptation of 20 minutes duration, the eye was exposed for five minutes to a luminance of 1500 ml. Parafoveal dark adaptation curves were obtained for a circular test-field and for a simple geometric shape, each of 3 degrees angular diameter, and exposed for 0.2 seconds. The adapting field and test stimuli were viewed through a 3 mm. artificial pupil. The graphic data show that the dark adaptation curve for form perception, although of the same general shape as that for light detection, was displaced upward along the log-luminance axis, the amount of displacement being about one log unit at the final rod-threshold. The theory of retinal organization put forth by Pirenne and Denton is reviewed, and correlated to the data of the present investigation. (5 figures, 25 references)

Ray K. Daily.

Horowitz, E. **Optical aids for subnormal vision.** Ophthalmologica **134**:421-429, Dec., 1957.

The progress made in the field of subnormal visual aids during the last few years is attributable to the availability of very clear, strongly refracting plastics, to the more general use of aspherical refracting surfaces, and to the combination of three or more elements into microscopic lenses. (3 figures, 7 references).

Peter C. Kronfeld.

Mackensen, G. **The influence of pleioptic treatment on the movements of amblyopic eyes.** Klin. Monatsbl. f. Augenh. **131**: 640-650, 1957.

Electro-oculography was done on 30 patients with amblyopic eyes. Not only fixation, but all movements of gaze become irregular and nystagmoid when the amblyopic eye leads. These irregular movements depend on the severity of the amblyopia and improve with treatment. (10 figures, 15 references)

Frederick C. Blodi.

Mahneke, Axel. **Electroretinography with double flashes.** Acta ophth. **35**:131-141, 1957.

The electroretinogram from the light-adapted and dark-adapted human eye, following two successive flashes of the same duration with varying dark intervals between the flashes (from 1 to 2000 msec.) showed the following. 1. The state of adaptation and the duration of the dark interval decisively influence the ERG. 2. In the light-adapted eye the response to two successive flashes is of the same type. They can be clearly dissociated on the tracings until the dark interval is of the magnitude > 25 to < 50 msec. The subject reports fusion at a dark interval of 25 msec. (3) In the dark-adapted eye the ERG configuration depends more on the dark interval. If it is > 50 to < 100 msec. the two complexes cannot be dissociated on the tracings. If the dark interval is > 100 to < 850 msec. the complex following the first flash is the same as after a single flash. The complex following the second flash has the same configuration as a light-adapted ERG after a single flash. If the dark interval is $\geqq 850$ msec. the a-wave in the ERG of the second flash widens and deepens, and the b-wave increases in width and amplitude. At a 2.000 msec. dark interval the two complexes are identical. Subjective fusion is reported at a 50 msec. dark interval. (2 figures, 21 references) John J. Stern.

Mayweg, Sigrun. **Amblyopia treatment with the after-image method.** Klin. Monatsbl. f. Augenh. **131**:51-61, 1957.

Of 33 patients who were treated, 10 had central fixation, the others excentric. The euthyscope of Cueppers was used. Occlusion of the amblyopic eye preceded the training in young excentric fixators. In all patients with central fixation vision improved to 0.5 and more. Among the patients with excentric fixation seven showed a marked and nine a small improvement; four patients remained unchanged. Hospital patients usually needed therapeutic sessions over a period of four to six weeks and outpatients required 12 to 80 sessions over a period of one month to one year. Three patients were treated who had lost the only good eye as adults. Under treatment normal vision was restored in the remaining amblyopic eye. (5 figures, 10 references)

Frederick C. Blodi.

Miles, P. W. **Children with increasing myopia; treated with bifocal lenses.** Missouri Med. **54**:1152-1155, Dec., 1957.

The problem of progressive myopia in school children is still unsolved. Ten children were given the full distance correction and a bifocal add of +.75 or +1.00 D. All were started before the age of 13 years and the refractive error in each was increasing at the rate of over 1 D per year. Six had an immediate and sustained decrease in the myopization rate and four showed no apparent effect. The refractive changes in 50 myopic children followed for 20 years were also analyzed and it was shown that the increase in myopia was at a fairly constant rate and approached zero at age 17. However, in this control series these were 14 percent who stopped progressing at about 13 years of age. The author concludes that the degree of myopia may depend on other factors than heredity alone and believes that this treatment should have further investigation. (5 figures, 2 references)

Edward U. Murphy.

Rendahl, Ilmari. **Clinical recording of the x-potential. A preliminary report.** Acta ophth. **35**:97-103, 1957.

In cases of protanopia it is possible to record a normal x-wave by using a photographic electronic flash with a red monochromatic filter. (6 figures, 17 references)

John J. Stern.

Rocco, Alfredo. **A rare case of degenerative myopia.** Arq. brasil. de oftal. **20**:124-127, 1957.

A five-months-old infant had esotropia, nystagmus and myopia which was estimated at −20 diopters in the right eye and −19 diopters in the left. The possible roles of heredity and developmental anomalies are discussed. (2 figures)

James W. Brennan.

Roelofs, C. O. and Zeeman, W. P. C. **The importance of contours for the perception of color fields.** Ophthalmologica **134**:121-130, Aug., 1957.

Most of the observations reported in this study were made on rotating white or colored discs on which were mounted concentric, black or differently colored rings with breaks of varying size. The sensation of brightness or of color was found to be dependent on whether or not the outline or contour of a ring was maintained in the stimulus pattern across the breaks. The presence of such contours very much accentuated the brightness or color sensation mediated by the rotating pattern. With regard to the mechanism of this accentuation the authors advance an interesting theory. The contour elicits the physiologic fixation nystagmus which prevents local adaptation and maintains a gradient of excitation in the retina. Physiologic impulses originate from such sites of gradients and not from retinal areas receiving uniform illumination. Contours may also accentuate sensations by giving rise to optomotor impulses and, thereby, to more definite localization of the objects received. (5 figures, 12 references)

Peter C. Kronfeld.

Roelofs, C. Otto. **The dependence of apparent refraction and accommodation upon the distance between eye and correcting lens.** Ophthalmologica **134**:37-47, July, 1957.

The true or real refraction of the eye is defined by the distance from its far point to its principal plane. The apparent refraction is defined by the power of the lens necessary to move the far point to infinity. That power is dependent, as is generally known, upon the position of the lens with regard to the principal plane of the eye. In the paper under review the author shows, in the form of tables and formulas, how the lens-cornea distance affects apparent refraction, apparent astigmatism, and the correction for presbyopia. (3 tables)

Peter C. Kronfeld.

Viefhues, Theo-Karl. **Prophylaxis and treatment of amblyopia ex anopsia in infants.** Klin. Monatsbl. f. Augenh. **131**: 827-830, 1957.

Pleioptic treatment is impossible in infants. Early treatment of amblyopias may make the pleioptic treatment unnecessary. The dominant eye should be patched whether the amblyopic eye fixates centrally or excentrically. Excentric fixators should become normal after two weeks of patching. If they do not, patching should be discontinued. (6 references)

Frederick C. Blodi.

5

DIAGNOSIS AND THERAPY

Albert, B., Elek, P., Herpay, Z. and Szilagyi, I. **Primycin and penicillic acid in ophthalmology.** Ophthalmologica **134**: 54-61, July, 1957.

Primycin, an antibiotic produced in Hungary since 1956, is highly effective as a bacteriostatic agent against all Gram positive organisms, but, because of its high toxicity, does not lend itself to parenteral administration. This high toxicity is shared by penicillic acid which was discovered ten years before penicillin. The combination of the two agents makes a convenient, water-soluble, stable and very effective antibiotic, particularly suited for topical administration. Favorable results in various eye conditions are reported. (2 tables, 18 references)

Peter C. Kronfeld.

Barraquer, Jose I. **A new blepharostat.** Ophthalmologica **134**:200-202, Sept., 1957.

Made of one piece of stainless steel wire, .029 inches thick, the new blepharostat weighs only .5 gm. and fits the configuration of the face without any protruding parts on which the sutures may become entangled. Because of its small size and weight the instrument has been given the name of "Colibri speculum." (3 figures) Peter C. Kronfeld.

Björk, A. and Kugelberg, E. **Visual field defects after temporal lobectomy.** Acta ophth. **35**:210-216, 1957.

The material for this study comprises 26 patients subjected to temporal lobectomy for epilepsy. They were examined by perimetry and campimetry. Twenty four patients had postoperative partial homonymous quadrantic anopia. There was a rough relationship between the magnitude of the visual field defect and the size of the resected brain portion. The resected portions of the temporal lobe and the visual field defects form a basis on which the author attempts to correlate topographically the visual field to the visual pathway. (4 figures, 17 references) Ray K. Daily.

Boehmig, G. A. **A new adaptometer for mass examinations.** Klin. Monatsbl. f. Augenh. **131**:737-740, 1957.

A Landolt ring is used which has been dyed with a fluorescent color. After 30 to 45 minutes of dark adaptation the patient is exposed to the ring in a dark room. The distance can be varied. The method is simple and fast. (1 figure) Frederick C. Blodi.

Caballero del Castillo. **Skin grafts in ophthalmology.** Arch. Soc. oftal. hispano-am. **17**:699-704. July, 1957.

In the reconstruction of constricted sockets Caballero used plastic tubes to hold the epidermal graft in place. After the graft is carefully sutured to the conjunctiva the plastic tube is placed against the graft and fixed in position with U sutures. The sutures are tied over glass beads, which permit their tightening or loosening as needed. The merit of the plastic tube resides in the fact that its compression is not as solid as that produced by compression devices of metal or wood, and consequently not as devitalizing to the graft. (7 figures) Ray K. Daily.

Cederlung, J., Liden, K. and Lindgren, M. **Radiation hazards during radon treatment of eye lesions.** Acta Radiol. **48**:205-208, Sept., 1957.

The gamma radiation hazards of beta-ray treatment of eye lesions with a radon applicator were studied. The doses received by the radiologist at five different parts of his body were determined by utilizing English type BD-11 ionization chambers. It was found that if a person gave from 10 to 15 two-minute treatments per week he would receive more than the maximum permissible body dose of 300 mr per week. Therefore a protective shield of iron blocks to enclose the head of the patient was constructed and it was found that this barrier would reduce the gamma radiation received by the radiologist by 90 percent. (2 figures, 3 references) William S. Hagler.

De Conciliis, U. **Xanthelasma and vitamine B_{12}.** Arch. di ottal. **61**:267-271, May-June, 1957.

In 23 patients, doses of 500 gamma given parenterally every four or seven days for 40 days had no effect on the xanthelasma or on the blood cholesterol. (1 table) Paul W. Miles.

Dybicka, A. and Kozakiewicz, A. **The value of hyaluronidase in corneal diseases.** Klinika Oczna **27**:617-622, 1957.

The authors used hyaluronidase in the

form of subconjunctival injections in 20 cases of corneal disease. Three injections of 45 units were used at intervals of one week. The best results were obtained in clearing scars after corneal wounds. Treatment was started two and one-half weeks after the injury. Corneal scars due to infections or lime burns and corneal ulcers did not improve. One pterygium was beneficially affected by hyaluronidase. In a secondary glaucoma with unabsorbed lens masses some improvement was seen after treatment. The authors feel that treatment with hyaluronidase should be used in fresh corneal scars, small pterygiums, secondary glaucoma and unsightly conjunctival scars. Six cases are presented for illustration. (8 references) Sylvan Brandon.

Ferreira Filho, L. **Blepharorrhaphy, pterygium and hypnosis.** Arq. brasil. de oftal. **20**:182-189, 1957.

The author presents the details of two patients upon whom he operated using hypnosis as the only means of anesthesia. One patient had a blepharorrhaphy for lagophthalmos and the other an excision of two pterygia of one eye. In each instance the surgical procedure was executed smoothly and with absence of discomfort to the patients. There was complete amnesia of the operative procedure, a feature which was most gratifying to both patient and surgeon.

James W. Brennan.

Gaertner, J. **Technical improvement on the stereocampimeter.** Klin. Monatsbl. f. Augenh. **131**:676-678, 1957.

This improved model of the hand campimeter (Haitz) allows close observation of the patient's eye to ensure central fixation. (2 figures) Frederick C. Blodi.

Gebertt, Stanislaw. **Buried orbital implant with extraconjunctival extension.** Brit. J. Ophth. **42**:54-59, Jan., 1958.

A new orbital implant is described which is totally buried but for four gold prongs which penetrate forward to lock into the prosthesis, thus insuring better motility of the latter. The surgical technique is described. The postoperative reaction is rather severe; of 13 implants three had to be removed. (11 figures, 2 references) Lawrence L. Garner.

Hirsch, P. **Beta irradiation in ophthalmology.** Klin. Monatsbl. f. Augenh. **131**: 776-797, 1957.

The author uses the American strontium applicator; 59 eyes were treated. The most frequent indications were: corneal vascularization preceding a keratoplasty, recurrent pterygium, sclerosing keratitis and iris granuloma. Conjunctival hemangioma and corneal papilloma responded well. Nevi and Fuchs' dystrophy did not respond at all. (14 figures, 5 tables, 52 references)

Frederick C. Blodi.

Hughes, Brodie. **Blood supply of the optic nerves and chiasma and its clinical significance.** Brit. J. Ophth. **42**:106-125, Feb., 1958.

The author reviews anatomic findings and attempts to correlate the vascular anatomy with some clinical records of visual fields in certain pathologic cases. It is interesting to note that at times there is no explanation for the clinical findings. (11 figures, 23 references)

Lawrence L. Garner.

Janert, H. **Premedication with phenothiazine for operations on the eye.** Klin. Monatsbl. f. Augenh. **131**:761-771, 1957.

The drug is a mixture of chlorpromazin, phenergan, demerol and phenobarbital. It resembles the "lytic cocktail" of the French authors. The experience on more than 1,000 operations was excellent and the general use of the drug is recommended. (3 tables, 38 references)

Frederick C. Blodi.

Kleefeld, G. **A plastic replica of the evaginated globe, with the purpose of aiding exact visualization of the topography of the retina.** Bull. Soc. belge d'opht. **116**:275-283, 1957.

The practical value of such models and their eventual exploitation in diagnosis of retinal diseases, particularly the localization of retinal tears will need further investigations. The preparatory measures for the standard model with its many special details, concerning landmarks of the inverted retina on the outside of the sclera are described. Two sterile copies of the standard models would be necessary for a detachment operation, one for making the points of attack, the second for marking the surgical results. Stereoscopic pictures of the two models would serve as the most exact evidence of the procedures applied and could be filed with the case histories. The concept and design of such a mold are both original and ingenious and deserve further study.

Alice R. Deutsch.

Kozousek, Vladimir. **Flickerperimetry.** Ophthalmologica **134**:243-259, Oct., 1957.

The light source of the Maggiore projection perimeter was replaced with an electronic flickering light source with a range from 500 to 700 millimicrons and a maximum output at 600 millimicrons. The standard area of stimulus on the perimeter arc was round and measured 10 mm. in diameter. The rate of flicker as well as the intensity of the light could be varied within wide limits.

With this setup retinal areas of 20 to 25° eccentricity showed the highest critical flicker frequency (CFF). From there the CFF dropped at about the same rate in both directions, that is toward the macula and toward the periphery. The author's principal perimetric technique was to select a certain intensity and flicker frequency and then to find the retinal areas which, under those conditions, barely fused the flickering stimulus. Thus, instead of the conventional isopters, the areas of equal sensitivity to flicker were determined. The application of this method to a number of clinical conditions is demonstrated. Some advantages over conventional perimetry are claimed. (13 figures, 24 references)

Peter C. Kronfeld.

Krueger, K.-E. **A simple method for the after-image examination.** Klin. Monatsbl. f. Augenh. **131**:674-676, 1957.

An electronic flash and reflector are used. Covers with various patterns (interrupted line, star) can be set in front of the light. The exposure time is markedly reduced. (2 figures)

Frederick C. Blodi.

Kuechle, H. J. **Current therapy for ocular lesions in medical practice. Part I and II.** Muenchen. med. Wchnschr. **45**:1616-1619, Nov. 1 and 1672-1676, Nov. 8, 1957.

Current concepts of therapy for ocular lesions are summarized for the nonophthalmologist. F. H. Haessler.

Leopold, I. H. **Therapy of vascular lesions of the fundus.** Inst. Med. Chicago, Proc. **21**:255-271, July 15, 1957.

As the title suggests, a very broad field is covered here. First, blood-borne diseases that involve the fundus are discussed. These include congenital vascular disease, heart failure, endocarditis, the blood dyscrasias, and coagulation defects. The next group concerns diseases of the blood vessels: pericarditis, disseminated lupus, hypertension and nephritis, temporal arteritis, and thromboangiitis obliterans. The treatment of all these conditions is systemic.

Retinal arterial occlusion is discussed in some detail, and many of the old remedies are debunked. Venous occlusion is discussed in the light of fibrinolytic and anticoagulant therapy. The problematical

relationship of macular lesions to vascular disease is entertained. A motley assortment is included here, and the discussion begins with the statement that there is no known therapy which is specific for macular lesions. However, heparin therapy seems interesting. Diabetic retinopathy is discussed in considerable detail. Therapy consists of control of blood sugar, fluid and electrolyte balance, ACTH and corticosteroid activity, pregnancy and infection; and the use of vitamin B12, agents which influence capillary antifragility, lipotropic agents, and heparin. (73 references) Harry Horwich.

Lindner, K. **The treatment of dermoid cysts with 30 percent trichloracetic acid.** Klin. Monatsbl. f. Augenh. **131**:669-670, 1957.

Two orbital and three suprapalpebral cysts are reported. The cyst is first opened, cleaned, irrigated and anesthetized. The acid is then applied with applicators. No recurrences were noted.
Frederick C. Blodi.

Margileth, A. M. **Comparison of ocular reactions using penicillin and bacitracin ointments in ophthalmia neonatorum prophylaxis.** J. Pediat. **51**:646-651, Dec., 1957.

The author has made a comparative study of ocular reactions to bacitracin ointment and penicillin ointment used as prophylaxis for ophthalmia neonatorum. A total of 7,774 newborn infants were treated with either penicillin or bacitracin ointments. No severe reactions were noted after the use of either of these antibiotics. The author concludes that bacitracin ointment is an effective and nonirritating drug for use as a prophylactic measure for ophthalmia neonatorum and has a low sensitizing index. Ideally one would use no prophylaxis and observe the eyes carefully. (1 figures, 3 tables, 19 references) Ted Suie.

Marx, Guenter. **Clinical experience with a new permanent magnet.** Klin. Monatsbl. f. Augenh. **131**:810-815, 1957.

The permanent magnet consists of a cobalt-aluminum-nickel core. The force of the magnet is comparable to that of an electric hand magnet. It served well in 28 operations. (3 figures, 2 tables, 7 references) Frederick C. Blodi.

Meunier, A. **The treatment of iris hernias with trichloracetic acid** (CCl_2COOH). Bull. Soc. belge d'opht. **116**:395-402, 1957.

The various types of iris incarceration and prolapse are described together with the related phenomena such as the size, age and stage of the specific iris involvement. The author's treatment of choice in iris hernias of medium size which are covered by conjunctiva is the cauterization with a saturated solution of trichloracetic acid which has a specific affinity for iris tissue. The cauterization can be repeated when necessary and is considered to be a safe and easy procedure; safe, because the coagulated iris proteins form a decisive barrier to infections and because the resulting scars are flat, dense and smooth. The enthusiasm for this method was not shared by all of the discussers. It was obvious that many surgeons not only object to this procedure but even condemn it as dangerous. (3 references) Alice R. Deutsch.

Mis, Marian. **A frame-measuring device attached to the exophthalmometer.** Klinika Oczna **27**:623-625, 1957.

The author describes an exophthalmometer which has an attachment for taking measurements necessary for fitting of frames. (3 figures) Sylvan Brandon.

Moi, Ivar. **Some diagnostic considerations in tumors near the optic chiasm.** Acta ophth. **35**:228-233, 1957.

The material for this analysis com-

prises 50 case histories of tumors near the chiasm; 36 of these were pituitary tumors. Two of them had been diagnosed previously as retrobulbar neuritis and two as optic atrophy. The other 32 patients had characteristic visual field defects and the diagnosis was established early. Fourteen tumors were extrasellar; ten of these were misdiagnosed as retrobulbar neuritis or optic atrophy. The diagnostic difficulties are discussed. It is pointed out that a well-developed bitemporal hemianopsia with a visual field defect starting in the upper temporal quadrant and relatively well preserved visual acuity is characteristic of intrasellar tumors. Marked unilateral loss of vision with a visual field defect beginning in the lower quadrants is characteristic of a suprasellar tumor. Air encephalography is valuable for verifying the diagnosis. (1 table; 14 references) Ray K. Daily.

Modelski, Stanislaw. **Needles for removal of corneal foreign bodies.** Klinika Oczna **27**:627-628, 1957.

A simple instrument is described for removal of foreign bodies imbedded in the cornea. (1 figure)

Sylvan Brandon.

Modelski, S. and Mazurowa, A. **The reaction of the circulatory system to typhoid vaccine used in eye disease.** Klinika Oczna **27**:607-615, 1957.

The authors investigated the reaction of the circulatory system to intravenous injections to typhoid vaccine in 850 eye patients. Their ages ranged from three to 70 years or more. No damaging results were noticed. Three cases of circulatory collapse were due to gall stones and diarrhea. The use of typhoid vaccine is contraindicated in known cases of heart muscle disease, coronary insufficiency or after cardiac infarct. However, in minor degrees of these conditions, vaccine can be given under strict supervision. In young and healthy individuals it can be given to outpatients. (1 table, 7 references)

Sylvan Brandon.

Offret, G., Saito, T. and Cabail, J. **Tuberculin. Its use in the management of uveitis. IV. Tuberculin therapy.** Arch. d'opth. **17**:650-689, 1957.

Offret and his collaborators discuss in detail the theoretical aspects of tuberculin therapy, in particular the relationship between allergy and immunity. They note that low doses of tuberculin are often sensitizing, and that for desensitization it is necessary to employ dosages close to those inducing general or focal reactions. They comment favorably on the use of cortisone to reduce the frequency or severity of such reactions during tuberculin therapy. They report 35 cases of uveitis with positive tuberculin tests and considered to be due to tuberculosis. About half the cases healed after tuberculin therapy. Best results were obtained in recent cases. The authors comment on their relative lack of success with chemotherapy. (1 table, 37 references)

P. Thygeson.

Offret, G., Saito, T. and Cabail, J. **Tuberculin. Its use in uveitis.** Arch. d'opht. **17**:541-566, 1957.

The authors review the subject of tuberculin in uveitis under the following headings: 1. general consideration of allergy in tuberculosis; 2. the tuberculin diagnostic tests; 3. the nature of uveal tuberculosis; 4. tuberculin therapy; and 5. clinical observations. In their discussion of tuberculous allergy, they review the phenomena of Koch and accept the dual sensitizing and immunizing role of allergy in tuberculosis. They discuss the sensitizing reaction to avirulent and dead bacilli, and to tuberculin, and comment that duration of tuberculin allergy is not indefinite. They cite evidence to indicate that tuberculin allergy disappears with the death of

bacilli in a focus. They discuss the technique and significance of the various tuberculin tests and note that a high degree of tuberculin sensitivity is the rule in ocular tuberculosis in contrast to the low sensitivity often found in pulmonary tuberculosis. They further discuss the significance of focal reactions to tuberculin. They take up the various forms of uveal tuberculosis and conclude that tuberculin tests, in spite of their shortcomings, have definite value in the diagnosis of uveal tuberculosis. P. Thygeson.

Oksala, Arvo. **Observations on tissue therapy and its hyperemic effect in some eye diseases.** Acta ophth. **35**:217-227, 1957.

The literature is reviewed, and 26 cases treated by subconjunctival implantations of placenta, and refractory to other forms of therapy, are reported. In a table they are classified as to age, sex, diagnosis, number of implantations, result of therapy, and pertinent notes. Encouraging results were obtained in two cases of chronic sclerokeratitis, one of uveitis, one of disseminated choroiditis, one of central serous chorioretinitis, one of secondary glaucoma and one of interstitial keratitis associated with congenital syphilis. The reaction to the implantation in uveitis was a hyperemia involving the entire anterior portion of the globe for one or two weeks. In other diseases the hyperemia was limited to the site of implantation. Oksala concludes that this safe and relatively simple therapeutic procedure is worth trying in cases resistant to other forms of therapy. (1 figure, 1 table, 37 references) Ray K. Daily.

Oksala, A. and Lethinen, A. **The diagnostic use of ultrasonic waves in ophthalmology.** Ophthalmologica **134**:387-395, Dec., 1957.

Ultrasonic waves tend to travel in straight lines and undergo refraction and reflection when striking a medium of different density or elasticity. The reflected beam can be recovered and recorded in a fairly simple manner. This record serves to define the location as well as the relative density of the reflector.

The authors of the paper under review first determined the zones of ultrasonic reflection or echoes in the normal eye. Shifts in their location or additional, that is pathologic, reflecting zones or bodies could be recognized with remarkable accuracy. Aluminum splinters of a size not demonstrable by ordinary X-ray technique produced a very definite echo when placed into the vitreous or sclera of enucleated cattle eyes. The method was applied to two patients with retinal detachment and revealed, in one of them, the presence of abnormal reflecting surfaces. Histologic examination revealed a melanoma.

The method is accurate enough for the in vivo measurement of the dimensions, that is the antero-posterior diameter of the globe. The authors' results are in close agreement with those of Mundt and Hughes, Am. J. Ophth. 41:488, 1956. (12 figures, 16 references)

Peter C. Kronfeld.

Pietrowa, Nonna. **A new malingering test.** Klinika Oczna **27**:626, 1957.

A simple test for the diagnosis of malingering is described. A trial frame is used in which the interpupillary distance can be adjusted. Occluders are put on both sides with central holes properly centered. A +8.00 diopter lens is put in front of the good eye. The patient is asked to read using both eyes.

Sylvan Brandon.

Pitter, Jaroslav. **Accurate control of the current in electrocoagulation.** Klin. Monatsbl. f. Augenh. **131**:678-680, 1957.

A clock mechanism regulates the time during which coagulation is applied. (2 figures, 4 references)

Frederick C. Blodi.

Prelevic, Vladimir. **A technique of wound closure in scleral resections.** Ophthalmological **134**:342-346, Nov., 1957.

For wound closure in penetrating scleral resections the author uses preplaced single-armed sutures, inserted in equal number and symmetrical position on each side (anteriorly and posteriorly) of the area to be resected. The scleral bites are about 2 mm. long, parallel to and about 1 mm. away from the edges of the section. Placed in this manner the sutures are entirely out of the way during the actual resection. The wound is closed by tying the corresponding ends of each pair of sutures in double overhand knots. While this sounds like a lot of knots, the apposition of the scleral wound lips is apparently very good. (4 figures, 13 references)

Peter C. Kronfeld.

Roeser, Johannes. **The use of the "lytic cocktail" in operations on the eye.** Klin. Monatsbl. f. Augenh. **131**:799-805, 1957.

The author injects a mixture of chlorpromazine, demerol and Thiantan, an antihistamine. The result in 571 operations was excellent. (31 references)

Frederick C. Blodi.

Sokolic, P. **Bilateral permanent blindness due to retinal angiospasm.** Ophthalmologica **134**:401-405, Dec., 1957.

The loss of sight in the 10-year-old boy occurred suddenly, first in the right and 24 hours later in the left eye. Examination two weeks later revealed fixed pupils, pale discs, some retinal edema and very narrow arterioles. Vasodilators applied subconjunctivally and retrobulbarly were of no avail. The discs continued to be pale, the arterioles became mere threads with white sheaths. The only abnormal systemic finding was intestinal infestation with trichocephalus dispar and 17 percent eosinophiles in the blood. The patient's mother was an epileptic. The author's interpretation of the pathogenesis: an inherited inclination toward angiospasm plus an acquired hypersensitivity to an allergen derived from the intestinal parasite. (2 figures, 8 references)

Peter C. Kronfeld.

Straub, W. **The quality of von Graefe's knife.** Klin. Monatsbl. f. Augenh. **131**: 680-683, 1957.

The examination of the knives can be done with the slitlamp or with the surgical microscope of Zeiss. (6 figures, 1 reference)

Frederick C. Blodi.

Tamler, E., Winter, F. C. and Toch, P. **Radiation effect on intraocular tissues in radon seed treatment of retinoblastoma.** A.M.A. Arch. Ophth. **58**:647-654, Nov., 1957.

To give additional information concerning the effect of radon seeds on ocular tissue, the authors describe an infant with bilateral retinoblastoma treated by external radiation, radon seeds, and triethylene malamine (TEM, a radiomimetic drug). Because of recurrences despite treatment, the left eye was enucleated. The actual dosage to various parts of the eye is calculated and presented in tabular form. The sclera was almost unaffected. The choroid, however, was almost obliterated in the affected zone. The ganglion cell layer of the retina showed considerable widespread damage and almost all layers of the retina showed cell death in peak zones of treatment. Retinal vessels were reduced to fibrous cords as in the choroid, suggesting that much of the damage was secondary to vascular occlusion. (12 figures, 12 references)

G. S. Tyner.

Vancea, P. **Clinical and experimental investigation of total extracts of the ocular globe.** Ann. d'ocul. **190**:860-871, Nov., 1957.

The author has prepared an alcoholic extract of whole beef eyes which he be-

lieves to be lipoidal in nature. In dogs the injections of these extracts causes a hypoglycemia, a leucopenia but an increase in basophiles and eosinophiles. Various experimental procedures were done in rabbits, such as measuring the healing time of controlled corneal injuries and infections. Finally 352 patients with various eye diseases received either subconjunctival, subcutaneous or local administration (or combinations of these) of the whole-eye extract. The results were "good," "satisfactory" and "unsatisfactory" in equal numbers. The best results were in the cases of traumatic origin and in those of corneal disease. In eight cases of retinitis pigmentosa and in degenerative chorioretinitis there was always subjective improvement "without objective evidence of alteration in the appearance of the fundus." (6 figures, 1 table, 13 references)

David Shoch.

Vucicevic, Momcilio. **Immobilization of the eyeball during intraocular operations.** Ophthalmologica **134**:417-421, Dec., 1957.

This is the author's procedure: 1. a corneal fixation suture at the limbus near 6-o'clock, 2. a fixation suture through the exposed insertion of the superior rectus, and 3. a similar fixation suture through the insertion of the medial rectus, placed through the conjunctiva without exposure of the muscle. (1 figure, 23 references)

Peter C. Kronfeld.

Wood, Everet H. **Vision chart for the ophthalmoscope.** A.M.A. Arch. Ophth. **58**: 752-753, Nov., 1957.

This chart is fastened on the handle of an ophthalmoscope. It is an AMA chart reduced in size and calculated to be read at 24 inches. (4 figures) G. S. Tyner.

Zahn, Karel. **The treatment of disturbances of retinal circulation: an experimental study.** Ophthalmologica **134**:47-54, July, 1957.

The effect of vasodilators, ganglionic blocking and other hypotensive agents upon the retinal circulation was studied in patients with various forms of vascular disease. The width of the angioscotomas and the retinal blood pressure (as determined by dynamometry) were measured before and after the administration of the drug. Reduction in the size of the angioscotoma or lowering of the retinal blood pressure was considered as a sign of improved retinal circulation. Most beneficial in this sense proved to be the drugs causing arteriolar dilatation. (1 figure, 3 tables, 4 references)

Peter C. Kronfeld.

6

OCULAR MOTILITY

Alajmo, A. **The question of acute concomitant strabismus; its nosological and clinical position.** Arch. di ottal. **61**:217-223, May-June, 1957.

The author discusses the literature, and classifies concomitant strabismus as infantile and late. Of the late types, there are the acute concomitant strabismus (Franceschetti) and the divergence deficit (Bielschowski). The latter type is found typically in fully corrected myopia, in which fusion is present for near but not at a distance.

Acute concomitant strabismus is diagnosed by the presence of diplopia without a paralyzed muscle. One case was reported in a seven-year-old child. Diplopia is not common in concomitant strabismus. In this acute type, prompt treatment will restore the former simple esophoria. The condition is similar to that found in heterotropia following occlusion of one eye.

Paul W. Miles.

Bonnet, P. and Bonnet, I. **Slowly progressive bilateral paralysis of the external rectus muscles.** Arch. d'opht. **17**:637-649, 1957.

The authors call attention to the not infrequent occurrence of bilateral sixth nerve paralysis in patients in the fourth decade of life. The paralysis is at first unilateral and transitory, but the attacks of diplopia are recurrent over a period of years, becoming more frequent and severe until after 10, 15, or 20 years the diplopia is constant, and a cosmetically disfiguring esotropia persists. In some of the cases the third nerve also becomes involved; occasionally the ophthalmic division of the fifth nerve is affected. The etiology of the syndrome is not known but German writers have suggested the possibility of an ischemic degeneration of the oculomotor nuclei due to arteriosclerosis.

On the basis of their studies extending over many years, the authors conclude that the syndrome results either from atheroma of the carotid, or from aneurysmal dilation of the carotid in the cavernous sinus. They report two illustrative cases. (7 figures) P. Thygeson.

Borras, A. **The time factor in the study of the extrinsic musculature of the eye.** Arq. brasil. de oftal. **20**:207-230, 1957.

The author believes that the element of time is of importance in evaluating fusion, although there have been few studies made or reported in the literature. The patient with heterophoria will frequently state that symptoms appear after using the eyes for a certain period of time, and for that reason the author determined to investigate what role time played in anomalies of the extraocular muscles.

Altogether 111 patients were studied, and 208 graphs of ocular deviations were made. The patient was examined with a heterophorometer at 33 cm., measurements of the deviation being recorded every 15 seconds. The apparatus consists in a red-green test, Maddox rod, and a scale which measures the deviation in prism diopters. The degree of deviation in prism diopters was recorded in the form of a graph.

Those patients who were considered as normal showed little irregularities on the graph. The majority of graphs had a rather flat aspect, although some undulation or inclination was observed. Those with heterophoria or heterotropia showed a greater irregularity in the graph. Patients with strabismus were divided into two categories—those with a normal sensorial state (normal retinal correspondence, lack of suppression and the presence of some fusion with amplitude as demonstrated on the amblyoscope), and those with an abnormal sensorial state. Extreme swings in the graph are found in the latter category, accompanied by abnormal retinal correspondence, suppression and lack of fusion. The strabismus patient who has had successful surgery and has regained a normal sensorial state shows a decrease of graphic variations and may eventually resemble a normal plateau. Some patients without strabismus who show normal values upon initial examination may change during the course of subsequent readings and reveal a graph of a frank heterophoria, thus explaining certain symptoms which may be present. (8 graphs, 13 references)

James W. Brennan.

Breinin, Goodwin M. **The nature of vergence revealed by electromyography.** A.M.A. Arch. Ophth. **58**:623-631, Nov., 1957.

The author reports accommodative and fusional vergence studies by means of electromyography. The studies reveal that opposing muscles do not cocontract but that there is an integration of impulses in the brain which results in a simple reciprocity mechanism. The studies also show that divergence is an active process and that fusional training is a central phenomenon which does not

result in greater muscle power. (14 figures 6 references) G. S. Tyner.

ten Doesschate, G. and Kummer, R. **Heterophoria and depth discrimination.** Ophthalmologica **134**:113-120, Aug., 1957.

This investigation was prompted by the somewhat conflicting views concerning the relationship between depth perception and flying or, more specifically, landing ability. Five thousand applicants for flight training, with unaided visual acuities of 20/20 or better in each eye, were tested for heterophoria and for defects of depth discrimination. The phoria test was made only in the horizontal direction, with a Maddox rod before one eye and a point source of light at six meters (details of measurement not given). The ability of depth discrimination was estimated with a slightly modified Howard-Dolman apparatus, again at six meters. The examinee had to line up one movable vertical rod with two fixed rods. The deviation of the middle rod from the theoretical position, determined as the mean of ten consecutive tests, was taken as a measure of the acuity of depth perception.

A statistically significant correlation between the amount of horizontal heterophoria and the acuity of depth perception was found. Tests for these two visual functions are considered to be of real value in the screening of applicants for flight training. A low score on the Howard-Dolman apparatus is "an alarm signal" suggesting more extensive examination of the applicant. (4 tables)

Peter C. Kronfeld.

François, J. and De Vos, E. **Abortive forms and heredity of the syndrome of Stilling-Duane-Türk.** Bull. Soc. belge d'opht. **116**:305-311, 1957.

The classical syndrome of Duane-Stilling-Türk consists of impaired or absent abduction with retraction of the eyeball and narrowing of the palpebral fissure in adduction. Vertical deviations, especially overaction of the inferior oblique, have also been observed. The syndrome is most often monocular, favoring the left eye, however 15 to 20 percent of binocular cases were observed. Incomplete cases demonstrating only a narrowing of the palpebral fissure or isolated paralysis of the superior rectus muscle also have been seen occasionally. Three families, carriers of this syndrome, were studied by the authors and the type of heredity was established as being autosomal, irregular, with incomplete penetration. (5 figures, 23 references) Alice R. Deutsch.

Morrell, R. M. **Oculomotor paralysis in diabetes mellitus.** Diabetes **6**:485-487, Nov.-Dec., 1957.

A 67-year-old uncontrolled diabetic who developed a third nerve palsy is described. With control of the diabetes the paralysis disappeared in the course of three months. Clinical control with diet and insulin provides the proper biochemical climate for recovery of function in such cases. (2 tables, 33 references)

Edward U. Murphy.

Ohashi, Kohei. **A test for oculomotor imbalances.** Ophthalmologica **134**:332-342, Nov., 1957.

The test described by the author is designed to recognize and measure the phenomenon of nonconcomitance in strabismus under conditions of binocular vision. In contradistinction to the cover test which measures the direction and magnitude of the deviation of the eye as it occurs behind a cover, Ohashi's test aims to record the position of the squinting eye without interference with binocular vision. The patient is placed in a supine position with a fixation target directly overhead and a glass plate with a rectangular grating placed before his eyes. The center of the grating is lined up with the fixing eye in primary position and the

deviation of the squinting eye estimated by means of the horizontal and vertical lines of the grating. These measurements are repeated in the cardinal positions of gaze and, specifically, in maximal sursumversion. Preoperative and postoperative findings in a number of squint cases are reported. (5 figures, 7 references)

Peter C. Kronfeld.

Ohm, J. **Miners' nystagmus.** Ophthalmological **134**:349-356, Nov., 1957.

J. Ohm, the life-long student and investigator of the problem of coal miners' nystagmus takes issue with K. Sroka's view (Ophthalmologica 125:183, 1953) that the principal cause of the high incidence of nystagmus in the Russian coal mines near the arctic circle was the very low oxygen and high carbon dioxide, carbon monoxide, and methane content of the prevailing atmosphere. Ohm restates his own view that insufficient lighting, sustained sursumversion of the eyes and sustained unfavorable position of head and neck together with frequent concussions of the body are the principal causes of miners' nystagmus. In the German coal mines nystagmus has become very rare, as the result of better and easier working conditions affecting the aforementioned factors and not the composition of the air. (14 references)

Peter C. Kronfeld.

Pawelec, Maria. **Changes in corneal refraction after squint surgery.** Klinika Oczna **27**:603-605, 1957.

The author examined 41 patients before and after surgery for squint. In 15 of them changes in refraction were found on the eighth postoperative day and also one month later. There was a change in corneal curvature, in some a decrease and in others an increase of curvature in the horizontal meridian. The author feels that the change in curvature is caused by the change of pressure of the muscles which were operated upon. Sylvan Brandon.

Schilf, E. **Bilateral complete external ophthalmoplegia with loss of labyrinthine sensitivity.** Klin. Monatsbl. f. Augenh. **131**:805-810, 1957.

A 36-year-old man developed a total ophthalmoplegia but no ptosis. Convergence was present. Ocular rotations could not be induced by stimulating the labyrinth or rotating the head. (15 references)

Frederick C. Blodi.

Scues, S. **Adaptometry in the amblyopia of strabismus.** Bull. Soc. belge d'opht. **116**:287-298, 1957.

The dark adaptation of 14 patients with strabismus was examined on the Goldman-Weekers adaptometer. The initial and final threshold and the speed of adaptation were charted on tables and graphs, comparing the results of the leading and amblyopic eye, respectively. The speed of adaptation in the amblyopic eye was found to be unchanged but the intensity of illumination had to be greater for the amblyopic eye. A deficit in the sensory activity of the foveal elements concerning form and light of different wave lengths suggested a deficiency in the activity of retinal elements together with disturbance in cortical perception. It would be interesting to establish a relationship between the size of the zone of inhibition in amblyopia and the elevated terminal threshold of adaptation. According to R. Weekers the zones of inhibition can be deliminated satisfactorily on the campimetric dipositive of the Synoptophore d'Oculus. (12 figures, 1 table) Alice R. Deutsch.

Tschiassny, Kurt. **Perrotatory nystagmus in the ballet dancer, pigeon, and blind persons: its application as a test for differentiating organic from psychic blindness.** Ann. Otol., Rhin. & Laryng. **66**:641-648. Sept., 1957.

Optokinetic and otokinetic nystagmus during rotation (perrotatory) were studied in the trained ballet dancer, in

the pigeon, and in the monocular blind human being. Ballet dancers are taught to maintain poise by brief rapid movements of the head to catch up with the pirouetting body. The movement is called "spotting" in that the eyes are fixed on some spot until the head must turn 360 degrees. It is known that such an abrupt start moves the labyrinthine fluid, but the abrupt stop soon after will reverse it, so that the vestibular stimulus is cancelled. On the Barany rotating chair, the dancer has past-pointing and nystagmus until she begins "spotting." When a pigeon is similarly rotated, the head will make similar correcting, then jerking movements. When blindfolded, the movements stop. The pigeon's perrotatory nystagmus of the eyes depends predominantly or even exclusively on vision, not otokinesis.

This phenomenon can be used clinically to determine whether blindness is organic or psychic. Patients are cited in whom rotation resulted in quick head movements and who had hysteria or were malingering, while true blindness will induce no "spotting" tendency. Nystagmus in man is chiefly optokinetic, not otokinetic. Paul W. Miles.

Urrets-Zavalia, Alberto. **Treatment of vertical ocular deviations.** Arch. Soc. oftal. hispano-am. **17**:717-746, July, 1957.

This discussion includes an exhaustive review of the literature. In the summary it is pointed out that the treatment of vertical deviations and the symptoms which they produce depend essentially on the pathogenesis of the deviation. Vertical heterophoria or latent concomitant vertical deviations are rarely so large that they produce symptoms; when they do, the symptoms can usually be relieved by the incorporation of a prism in the glasses. The same is true of pseudohyperphorias caused by heterotopia of the macula unless they are associated with metamorphopsia and aniseikonia, in which case the symptoms may persist in spite of the prismatic correction. Vertical dissociated anomalies or purely innervational disturbances are not correctible. If they are isolated disturbances practically nothing can be offered for their relief; if they are associated with other reversible disturbances of ocular motility the symptoms may be relieved to the extent to which they depend on the reversible disturbance. Acquired paralysis of the vertical muscles, if recovery has not taken place in a few months, requires surgical intervention; in the meantime occlusion of the affected eye relieves the patient of the diplopia and prevents secondary muscular disturbances. Early paralytic disturbances and congenital insufficiency of the vertical muscles have usually the character of malformations and are usually bilateral and more or less symmetrical. They are invariably associated with horizontal deviations and produce severe sensory disturbances. Surgery must be done not only for the muscles primarily affected but also for those affected secondarily. For the sensory disturbances pleoptic or orthoptic therapy is indicated. (1 figures, 90 references)

Ray K. Daily.

7

CONJUNCTIVA, CORNEA, SCLERA

Bietti, G. B. **The present status of chemotherapy and antibiotic treatment of trachoma.** Bull. Wld. Hlth. Org. **16**:975-994, 1957.

Sulfonamides and certain antibiotics are active against trachoma, but the virus is only moderately susceptible. Despite clinical improvement the disease may persist for a long time. Treatment must therefore differ from that of bacterial infections. The principal difference consists in the necessary length of treatment, up to 20 weeks. With therapy combining sulfonamides and antibiotics a cure can be expected in 50 to 80 percent of the pa-

tients. Long-term treatment may remain effective when administered at intervals rather than continuous. Repository drugs which can be given at intervals over a long period are recommended. Resorption of the conjunctival infiltrations takes time and a cure can be confirmed only after weeks or months. The effectiveness of the treatment can be assessed according to various criteria; the clinical and microbiologic pictures may be deceptive because they may indicate merely the effect on secondary infection. The change in the characteristic epithelial inclusions seems to be a more useful indication of the effect of treatment. It has not been possible to draw up a scale of effectiveness for the various therapeutic products. Sulfonamides are all effective.

Of the antibiotics, penicillin is the least and the tetracyclines the most active. Other antibiotics lessen the acute symptoms by acting on the concomitant bacterial flora. Para-aminosalicyclic acid, isoniazid and para-aminobenzoic acid are not effective. It is probable that prophylactic action by preventing the appearance of seasonal conjunctivitis with sulfonamides and antibiotics will lead to a reduction in the incidence of trachoma. The causative agent of trachoma is considered to be a highly organized corpuscular virus. Forms of the trachoma virus may exist which are invisible under the optical microscope, and which are localized outside the epithelium. (46 references) John J. Stern.

Bonavolonta, A. **Bilateral perforating keratomalacia in a subject with chronic polyarthritis and primary adenosplenomegaly.** Arch. di ottal. **61**:241-257, May-June, 1957.

The case of a 62-year-old domestic is reported in great detail. After 12 years of severe arthritis, she developed symmetrical bilateral perforating corneal ulcers. It was a chronic degenerative necrotic keratitis with perforation in spite of local and general antibiotics, mydriatics, and local cortisone. The arthritis had been treated with iodides, vitamin B, sulfonamide, atophan, and cortisone. The vision of the right eye was limited to counting fingers. There was a two-millimeter leukoma with superficial and deep vascularization, organized exudates about the pupil, cataracta complicata, and slight elevation of tension. The vision of the left eye was 2/10 with a similar leukoma and some posterior iris synechiae.

Keratomalacia is rare, but probably related to scleromalacia. Histologically, the latter contains rheumatic nodules with central necrosis, granulation, giant cells, white blood cells and plasma cells. (2 photographs in color)

Paul W. Miles.

Conrads, H. **A histologic study of the pinguecula in bandshaped keratopathy.** Ophthalmologica **134**:97-100, Aug., 1957.

Possibly because of their prominence and conspicuousness, the pingueculae in two cases of bandshaped keratopathy were excised and examined histologically. The findings were indicative of a slowly progressive, degenerative and partly necrotizing process. (6 figures, 14 references) Peter C. Kronfeld.

Conrads, H. and Kuehnhardt, G. **The pathogenesis of the hemorrhagic lymphangiectasia of the conjunctiva.** Klin. Monatsbl. f. Augenh. **131**:670-674, 1957.

This is a posttraumatic condition. Histologic examination revealed markedly enlarged lymph vessels. (4 figures, 10 references) Frederick C. Blodi.

Dohlman, Claes-Henrik. **On the fate of the corneal graft.** Acta ophth. **35**:286-302, 1957.

This is an experimental study on rabbits. The experimental plan is described in detail. The corneal grafts were tagged with radioatcive sulfur and transplanted

to unlabeled animals. It was found that in the normal cornea the S^{35} had a biologic half life of about 32 days. In the graft the radioactivity rapidly decreased to about one-third of the normal value in two weeks. The decline in radioactivity was interpreted as a loss of sulfomucopolysaccharides in the ground substance. The cellular components of the graft, insoluble in trichloracetic acid, were labeled with P^{32} before transplantation. The result indicated that cell death in the graft occurred at a considerably increased rate after keratoplasty. Histologic study of graft layers at different periods of time after transplantation demonstrated considerable cellular degeneration and cell death as well as regenerative processes, even in the most successful grafts. There was no sign of massive destruction of collagen fibrils of the stroma or of Descemet's membrane. The results of the investigation support the theory that the stroma fibers and Descemet's membrane of a homograft are not replaced, but that the interfibrillar ground substance and the cells are rapidly substituted by the host. (8 figures, 31 references) Ray K. Daily.

Dohlman, Claes-Henrik. **On the metabolism of the corneal graft,** Acta ophth. **35**:303-310, 1957.

This is an experimental study on rabbits. The experimental pattern is described in detail. The material comprised 84 keratoplasties in 42 rabbits. The objective of the investigation was to determine the power of the stroma cells of the graft to synthetize sulfomucopolysaccharides in vitro at varying intervals after keratoplasty, and to gather some information on the time and extent of cellular damage and the rate of repair. At different time intervals after corneal transplantation the power of the cells in the graft and in the cornea of the host to incorporate S^{35} sulphate into organic substances was determined by in vitro incubation of the excised cornea with the isotope. It was found that the uptake of the isotope was reduced greatly immediately after the operation and did not approach normal until at least 10 days later. The surrounding host cornea followed the recovery pattern of the graft. The rate of wound healing of the cornea after keratoplasty was followed by administration of S^{35} sulphate in vivo and subsequent autoradiography. The conclusions from the data, which are reported graphically, are that there is a net loss of mucopolysaccharides immediately after keratoplasty, and since the proteins of the ground substance are firmly combined with the mucopolysaccharides it is assumed that proteins are also lost. The findings thus support the theory that rapid elimination of the total donor ground substance occurs after keratoplasty. The investigation also supports the theory that death of all cells in the graft stroma does not occur at any time after keratoplasty. The viability of the cells showed an increase rather than a decline. Autoradiography of corneas after keratoplasty was correlated with the chemical analyses. The most striking feature of the autoradiographs is the heavy uptake of a radiosulphate in the wound edges of some corneas. After one and four days nothing can be seen there, but after eight days the isotope began to accumulate in the wound concurrently with the appearance of fibroblasts. The uptake was especially abundant where poor apposition between the edges caused extensive fibroblast invasion and formation of much granulation tissue. On the 34th day the graft had healed in completely, the cornea was thin, the fibroblasts had disappeared and the uptake of S^{35} was normal even in the scar. The autoradiographs were correlated with the histologic appearance of the graft edges. (3 figures, 14 references) Ray K. Daily.

Dyudina, Z. **A new method of treating trachoma by Etazol combined with Roni-**

dase. Vestnik oftal. 6:32-37, Nov.-Dec., 1957.

Etazol (aethazolum) was an effective remedy in the treatment of all stages of trachoma. In trachoma with severe scarring of the conjunctiva and tarsus, Etazol was combined with Ronidase; the latter contains the ferment hyaluronidase which destroys hyaluronic acid, one of the components of connective tissue and intercellular substance. In scars hyaluronic acid is increased and penetrability of the tissues is also increased. Thus Ronidase, by increasing the penetrability of the tissues and the process of diffusion, makes possible the more prolonged action of Etazol. Etazol was used both locally and systemically. Locally it was used three times daily in a 5-percent ointment combined with massage and expression of the conjunctiva.

During the years 1955 and 1956, 667 patients with trachoma grade III were treated. In more than half of these patients great improvement was noted. This treatment shortens the time of treatment from one to three months. The preparations have no side effects. This new method of treatment of trachoma has not been used anywhere else previously.

Olga Sitchevska.

Ebadi, A. G. **Operation for pterygium by a free graft of the conjunctiva.** Ann. d'ocul. 190:778-780, Oct., 1957.

The author reviews the usual procedures for correction of pterygium. He then outlines his own method which consists of removing the lesion completely and filling in the resulting defect with a free graft of conjunctiva taken from the superior portion of the same eye. He feels that this is preferable to labial mucosa since the tissue is thinner and a better match.

David Shoch.

Ebenius, B., Larsson, S., Cederquist, E. and Christiansson, J. **Radiation therapy in vernal conjunctivitis.** Acta Radiol. 48:193-204, Sept., 1957.

Eleven cases (20 eyes) of severe vernal conjunctivitis were given radiation therapy after the more conservative methods of treatment had failed. There were two eyes with limbal changes, both of which were treated with radon as well as four other eyes with tarsal changes. The remaining 14 eyes were treated with contact roentgen radiation. All patients were followed for a period of from two to 11 years; 18 eyes showed complete subjective and objective cure, and the remaining two showed considerable improvement. No definite difference was found between the two methods of treatment, but in view of the difficulty of controlling the dosage when using radon, and the hazards involved, contact roentgen therapy is considered to be the preferable method. (10 figures, 8 tables, 17 references)

William S. Hagler.

Eroshevsky, T. **Achievement in the field of corneal transplantation.** Vestnik oftal. 6:3011, Nov.-Dec., 1957.

The first successful transplantation was done by Filatov in 1924 and in his institute much experimental work was done until his death two years ago. About 4,000 keratoplasties were done by Filatov's school and about 6,000 in all other hospitals in the U.S.S.R. About 200 ophthalmologists are doing keratoplasty.

The hand hermetic trephine prevents the outflow of the aqueous and injury of the lens. The fixation of the transplant by a conjunctival flap or by a celluloid flap is the best physiologic method. The use of cadaver's cornea preserved at a low temperature for three or four days gives enough material for corneal transplantation. The problem of conservation of the cornea still requires further investigation. Filatov was the first to establish the trophic influence of the cadaver's cornea upon the clearing of the cornea. This was

confirmed by Castroviejo, Paufique, and Sourdille. The further development was the subtotal keratoplasty. The majority of these (250) operations were done by Putckovskaya. Barchash has done 235 partial and subtotal keratoplasties in children, with good visual results in 53 percent. However, sub-total keratoplasty requires further improvement for the prevention of postoperative opacification and formation of new vessels of the transplant, of glaucoma and of prolapse of the vitreous during the operation.

Olga Sitchevska.

di Ferdinando, R. and Gattini, E. **Treatment of vernal conjunctivitis with antihistaminics, cortisone and ACTH.** Gior. ital. oftal. **10**:3-15, Jan.-Feb., 1957.

An account is given of the treatment of 153 patients with spring catarrh with synthetic antihistaminics, cortisone and ACTH. The ACTH was used intradermally and the others locally. Results were good but temporary; most effective was ACTH, particularly if it was combined with local applications of cortisone. Photophobia and itching were relieved but no actual cure was observed and there was no assurance that seasonal relapses were prevented. (29 references, 5 tables)

V. Tabone.

François, J., Rabeay, M. and Evens, L. **Melanotic tumors of the conjunctiva bulbi.** Bull. Soc. belge d'opht. **116**:415-439, 1957.

The authors discuss the extreme malignancy of some melanotic tumors and the difficulties in their clinical and pathological evaluation on the basis of a classification very similar to that of A. Reese. A nevus may change in appearance, its pigmentation may increase and it may increase in size by enlargement of its cysts. This happens frequently at puberty and is not a sign of malignancy. The transformation of a nevus into a nevocarcinoma is very rare. Dark black discoloration of the growth, rapid vascularization and increase in size are the clinical characteristics. The appearance of melanin in the urine generally is considered to be a secondary sign of a change toward malignancy. Precancerous melanosis and cancerous melanosis are less rare. Persons 40 years old or older are most often affected. The spread of this type of growth is very slow without any uniformity in pigmentation or invasion. The authors report the clinical and pathological findings in detail in 18 cases.

Nevi should be left undisturbed except in locations of continuous irritation or with recurrent inflammations or signs of malignant change. Congenital melanosis is radium resistant and should not be treated either by irradiation or surgery. Galvanocautery is condemned and diathermy coagulation is not advised, except in selected cases. Radical excision with preceding deliminating diathermy coagulation is recommended for localized tumors. The prognosis is poor, even in apparently localized growth. Reese's estimation of the mortality in cancerous melanosis equals 40 percent. (22 figures, 32 references)

Alice R. Deutsch.

Fulgosi, A. and Frank, P. **The treatment of pterygium with radioactive strontium.** Ophthalmologica **134**:410-416, Dec., 1957.

With a surgical technique consisting of careful freeing of the pterygium, resection of only its head and succulent edges and suturing of the conjunctiva to the sclera, the authors observed 74 percent recurrences during the first year. Combination of the same surgical technique with beta-radiation yielded decidedly better results. The recommended total dose for patients under 30 years of age is 5,000 rep given in three or four sittings. In older people 3,600 rep are sufficient. The follow-up periods, unfortunately, were very

short, all under seven months. (2 figures, 13 references) Peter C. Kronfeld.

Gaipa, M. **A case of malignant melanoma at the limbus.** Gior. ital. oftal. **10**:26-32, Jan.-Feb., 1957.

A malignant melanoma in the region of the limbus appeared 15 months after removal of a benign congenital nevus from the same site. The rarity of the condition is stressed and the histologic findings are described. (4 figures, 18 references)

V. Tabone.

Gall, J. **The role of neurohormonal factors in the etiology of keratoconjunctivitis sicca.** Ophthalmologica **134**:29-36, July, 1957.

A number of clinical observations made by the author suggest a relationship between atrophy or total loss of one gonad and a contralateral disturbance of lacrimal secretion. (9 references)

Peter C. Kronfeld.

Glees, M. **Crystalline degeneration of the cornea.** Klin. Monatsbl. f. Augenh. **131**:721-724, 1957.

A 27-year-old man with crystals in the corneal stroma is described; he had no cystinuria, but slightly increased serum bilirubin. (2 figures, 8 references)

Frederick C. Blodi.

Jablonska, S., Segal, P., Milewski, B. and Dabrowska, H. **Pemphigoid mucosae. The so-called pemphigus ocularis and its relation to pemphigus.** Acta Dermato-Venerol. **37**:364-375, 1957.

Pemphigus ocularis is a distinct entity. It involves all mucosa that is exposed externally, but is most pronounced in the conjunctiva. The characteristic histologic picture of pemphigoid mucosae is that of the cellular elements of inflammation plus the presence of epithelioid cells; whereas in pemphigus vulgaris the epithelioid cells predominate and show acantholysis as a characteristic picture. (2 figures, 36 references)

Irwin E. Gaynon.

Lodin, A. and Gentele, H. **Benign mucous membrane pemphigoid (pemphigus conjunctivae).** Acta Dermato-Venerol. **37**:357-363, 1957.

Pemphigus conjunctivae is a definite clinical entity. It is not related to pemphigus vulgaris or dermatitis herpetiformis. Prognosis is favorable, but is resistant to therapy. It does respond to massive doses of corticosteroids and ACTH. (4 figures, 2 references) Irwin E. Gaynon.

Mangiaracine, A. B. and Liebman, S. D. **Fungus keratitis (aspergillus fumigatus).** A.M.A. Arch. Ophth. **58**:695-698, Nov., 1957.

The patient showed clinically a large grayish-white central corneal ulcer with hypopyon. The diagnosis of fungus infection was established by scrapings and culture. Although other agents were used in the treatment, the authors believe that it was the Nystatin which exerted a favorable influence. It was used locally as a suspension of 500,000 units of the drug in 10 cc. of a vehicle made up of NaCl 1.2 gm., chlorobutanol 0.5 gm., and in 100 cc. of water. Systemically it was given as 500,000 units of Nystatin orally every eight hours. (5 figures, 10 references)

G. S. Tyner.

Margileth, Andrew M. **Cat scratch disease as a cause of the oculoglandular syndrome of Parinaud.** Pediatrics **20**:1000-1005, Dec., 1957.

The importance of skin testing patients who have preauricular adenopathy with cat-scratch antigen is emphasized. Surgical excision of the primary conjunctival lesion seems to shorten the course of the disease. Antibiotic therapy is apparently ineffective. (2 figures, 1 table, 7 references) Irwin E. Gaynon.

Moro, F. **A case of Bowen's disease of the cornea and conjunctiva. Treatment by lamellar keratoplasty.** Ophthalmologica **134**:259-271, Oct., 1957.

At the time of the first examination the tumor in the right eye of the 79-year-old male patient occupied the inferonasal quadrant of the cornea with a slight but definite extension into the conjunctiva. The tumor was of yellowish-gray color and caused considerable thickening of the affected portion of the cornea. A two-stage operation was decided upon, first an excision of most of the tumor and repair by lamellar keratoplasty and later an excision of the remaining tumor tissue, again with repair by keratoplasty and conjunctivoplasty. The first step resulted in a fairly clear graft and a gradual disappearance of all visible remnants of the tumor. No second step, therefore, was taken. There were no signs of recurrence eight months later. The histologic diagnosis was Bowen's disease. (8 figures, 32 references) Peter C. Kronfeld.

Oppel, Ottomar. **The relation between macro-(megalo-) cornea and buphthalmus.** Klin. Monatsbl. f. Augenh. **131**:819-823, 1957.

A father with megalocornea had a child with bilateral hydrophthalmus. (2 figures, 23 references) Frederick C. Blodi.

Ponghis, G. **Some observations on the role of the fly in the transmission of seasonal conjunctivitis in southern Morocco.** Bull. Wld. Hlth. Org. **16**: 1013-1027, 1957.

Reduction of the fly population was most effectively achieved in 24 villages with residual insecticides (chlordane). A correlation was established between the number of flies and the frequency of acute and subacute conjunctivitis. Children two to eight years old were the most susceptible and the last group to benefit by a reduction in the fly population, those 8 to 15 years of age showed the greatest reduction of conjunctival morbidity. This confirms the importance of flies in the spread of seasonal epidemic eye infections and demonstrates the necessity for fly control in under-developed countries.

John J. Stern.

Postic, Svetozar. **Clinical aspect of simple initial trachoma in Iran.** Bull. Wld. Hlth. Org. **16**:1044-1046, 1957.

The author has found that the first definite sign of early trachoma is a characteristic slight thickening of the upper tarsus. It is recognized early by palpating the everted upper lid between both thumbs. A second sign is the appearance of a thickened plaque in the conjunctival fornix immediately below the convex edge of the tarsus.

John J. Stern.

Pruchnicka, Maria. **Investigation of human corneal ulcer in vivo.** Klinika Oczna **27**:577-589, 1957.

The author presents the theory of Grawitz in which it is postulated that tissues have numerous dormant particles which can be stimulated into growth to form defense cells, mainly leucocytes. According to this theory infiltration around a focus of infection derives its cells mainly from the tissue itself. Nonvascular corneal ulcers were examined microscopically in 25 patients; 18 of them were posttraumatic, others of unknown origin. Of these ulcers thirteen were bacteriologically negative, in four staphylococcus was found, in three a mixture of staphylococcus and streptococcus, and in the remaining cases various other bacteria. Ulcers were scraped and the material was put on slides to be stained and examined microscopically. Cells and all formed elements are described, noting their position in relation to the center or periphery of the ulcer. The author supports the theory of Grawitz and feels that formed particles found in the scrapings do not represent

broken down leucocytes but that corneal tissue produces its own elements of defense. (9 figures, 4 references)

Sylvan Brandon.

Schofield, P. B. **Non-pigmented intra-epithelial melanoma of cornea.** Brit. J. Ophth. **42**:99-105, Feb., 1958.

An eye is described in which there was an intra-epithelial melanoma of one half of the cornea and a malignant melanoma at the limbus on the opposite side. The two lesions were separated by healthy corneal epithelium and were not pigmented, which made the diagnosis more difficult. (6 figures, 30 references)

Lawrence L. Garner.

Simkova, M. and Berman, G. **Ocular changes in chronic porphyria.** Acta ophth. **35**:279-285, 1957.

The literature on porphyria in general and its ocular symptoms is reviewed and Waldenstrom's classification described. This investigation is concerned with the determination of whether the increased amount of porphyrin in the blood and in the tissues raises the photosensitivity of the ocular tissues, especially of the conjunctiva and cornea. Thirty patients with chronic porphyria and skin manifestations were examined by staining of the conjunctiva with Bengal red. To insure the recognition of early cases an injection of atropin as a provocative test for dryness was made prior to the staining. The tabulated data show that 90 percent of the patients had dryness of the conjunctiva and cornea. The staining, a result of epithelial defects, took the form of numerous fine dots arranged in groups or in confluent sheaths. The severer cases of keratoconjunctivitis sicca were associated with cutaneous disturbances; only 27 percent of the mild cases had skin disturbances. Twenty-four patients had subjective disturbances, such as dryness, photophobia, foreign body sensation, pain and redness of the eyes. Since none of the patients had rheumatic disturbances, anemia or gastric hyperacidity characteristic of Sjøgren's syndrome, it is obvious that here the etiology of the keratoconjunctivitis is different than that in the Sjøgren syndrome. The authors believe that here the raised ocular photosensitivity is produced by processes which take place within the corneal and conjunctival tissue itself. (1 table, 13 references) Ray K. Daily.

Thygeson, P. **Etiology and differential diagnosis of non-trachomatous follicular conjunctivitis.** Wld. Hlth. Org. Bull. **16**:995-1011, 1957.

Six different types of nontrachomatous acute follicular conjunctivitis are now recognized: inclusion conjunctivitis, acute follicular conjunctivitis of Beal, epidemic keratoconjunctivitis, acute herpetic conjunctivitis, Newcastle disease conjunctivitis, and pharyngoconjunctival fever. Also described are chronic follicular conjunctivitis, toxic follicular conjunctivitis (molluscum contagiosum and eserine), and folliculosis. Clinical differentiation is possible in most cases and etiological diagnosis is possible in seven of the ten entities. (1 table, 36 references)

Edward U. Murphy.

Wolter, J. R. and Henderson, J. W. **Cornea guttata.** Klin. Monatsbl. f. Augenh. **131**:725-737, 1957.

A 57-year-old man who had a corneal transplant because of Fuchs' epithelial dystrophy is described. On the 19th postoperative day the eye had to be eviscerated because the psychotic patient had injured himself severely. Hyaline bodies on Descemet's membrane were found in the excised piece of the cornea. The endothelium was missing over these bodies and the pathologic changes tapered off toward the periphery. In the clear transplant large or spindle-shaped stromal cells were present. The author assumes that cornea

guttata is a primary degeneration of the endothelial cells which produce the characteristic hyaline excrescences. (14 figures, 11 references) Frederick C. Blodi.

8

UVEA, SYMPATHETIC DISEASE, AQUEOUS

Appelmans, M., Michiels, J., Misotten, L. and Alearts, R. M. **Posttraumatic uveitis with deposition of cholestererol crystals.** Bull. Soc. belge d'opht. **116**:342-251, 1957.

Ocular xanthomatosis represents a triad of typical pathologic signs which include accumulation of spongiocytes, cholesterol crystals and hemosiderin after a traumatic hemorrhage or one that occurs during an intraocular disease such as Coats' disease. Local lipoidosis, on the contrary, is the result of cellular necrosis without hemorrhagic factors; it may be found in absolute glaucoma or during intraocular disorganization in the presence of an intraocular tumor. Cholesterol crystals in the anterior chamber are very rare. They were seen in the left eye of a 25-year-old man who had had a severe injury years ago. At the time of examination the eye was blind and painful with a dense corneal scar. Three clearer spots in the leucoma revealed masses of cholesterol crystals in the anterior chamber. The blind eyeball was removed. The pathologic diagnosis was ocular xanthomatosis following either one severe hemorrhage or recurrent intraocular hemorrhages. Hematine and cholesterol are liberated in and after hemorrhages, but because of the severe nutritive damage to the eye they could not be eliminated and became stagnant. The hemosiderin could be carried away in part but the cholesterol formed crystals and caused the development of a pseudotumor. A generalized intraocular fibrosis closed the chamber angle and was followed by a severe increase in tension and loss of the eye. A detailed anatomic and pathologic report is included. (5 figures, 20 references) Alice R. Deutsch.

Boeke, Wilhelm. **Angioma of the choroid.** Ophthalmologica **134**:373-379, Dec., 1957.

Three cases of clinically diagnosed and anatomically verified choroidal angioma are reported. In two of them the choroidal lesion was associated with congenital hemangiomas (nevus flammeous) of the face. In the third case, in a 42-year-old male, the choroidal tumor had probably not existed in macroscopic or clinical form for more than one year. During a fairly long period of observation it remained the only demonstrable angiomatous lesion. Cases of the latter type may be difficult to diagnose at first, but during an observation period of 6 to 12 months usually develop features which distinguish them from malignant melanomas or inflammatory processes. If the diagnosis could be made during an early stage, Meyer-Schwickerath's method of light coagulation might be applicable. (5 figures, 22 references) Peter C. Kronfeld.

Jensen, O. A. **Choroid metastasis from a malignant melanoma of the skin.** Acta ophth. **35**:91, 1957.

One year after the excision of a malignant melanoma of the dorsal skin an intraocular tumor was discovered which resulted in secondary glaucoma and enucleation. At this time there were widespread metastases and a recurrence at the site of the original tumor. Post-mortem examination showed metastases from a malignant melanoma in all internal organs and the eye. It is emphasized that in the presence of an ocular tumor the possibility of metastases must be considered. (3 figures, 14 references) John J. Stern.

Kevers, G. and Niffle, J. M. **Hypertensive iridocyclitis in a leper.** Bull. Soc. belge d'opht. **116**:322-327, 1957.

A 52-year-old man had severe, recurrent nodular iridocyclitis, refractory to local and systemic treatment up to the time when the correct etiologic diagnosis was disclosed. A positive serologic report and the history of a syphilitic infection suggested syphilis as the cause for the eye disease for a long time. Pronounced eosinophilia, a filarial infection of long standing and a stay in the Belgian Congo for several years suggested filariasis. Diverse leprous manifestations on the lids, superciliary region and hands finally led to the diagnosis of uveitis in leprosy. After a severe local reaction to sulfonotherapy with sulfonamides similar to a Herxheimer reaction, the eye disease improved considerably. There are very few authentic reports on the ocular pathology of leprosy. Alice R. Deutsch.

Rowen, G. E. **Leptospiral uveitis.** A.M.A. Arch. Ophth. **58**:754-757, Nov., 1957.

Leptospiral uveitis is usually mild and seldom results in loss of vision. Severe sequellae can occur but are rare. The diagnosis is established by blood agglutinins. There is no specific treatment. (32 references) G. S. Tyner.

Sanchez Agesta, R., Casado Corzo, J. P. and Moreno Lupianez, E. **Fuchs' diktioma.** Arch. Soc. oftal. hispano-Am. 17:709-716, July, 1957.

The authors report the case of a man, 21 years of age, whose eye was enucleated because of a recurrent iridocyclitis and secondary glaucoma caused by the appearance of a neoplasm in the ciliary body. Histologic examination of the globe resulted in the diagnosis of a nonspecific iridocyclitis and a diktioma. The literature on tumors of the ciliary region is reviewed and the pathogenesis of diktioma is discussed. It is believed that in this case the inflammatory process gave impetus to the growth of the benign congenital undifferentiated embryonal diktiomatous cells. (6 photomicrographs, 8 references) Ray K. Daily.

Westerveld-Brandon, E. R. and Zeeman, W. P. **The prognosis of melanoblastomas of the choroid.** Ophthalmologica **134**:20-29, July, 1957.

A follow-up study of 103 cases of histologically verified melanoblastoma of the choroid was made at the University of Amsterdam. The period of observation after enucleation of the affected eye was five years or longer. The histologic distinction between benign and malignant melanoblastomas proved difficult and uncertain in some of the cases. The authors are not in full agreement with the criteria of malignancy as formulated by Callender, Wilder, and Ash. "Benignancy or malignancy can only be established on the basis of the extent to which the expectation of life is prolonged or shortened by the tumor."

In 46 cases of this series death due to metastases occurred during the 15-year period following the enucleation. Of these 46 patients, 32 died during the first year, eight during the second, and six during the third five-year period following the enucleation. From these observations the authors estimate the mortality rate of melanoblastoma of the choroid to be in the neighborhood of 50 percent. There is, however, a strong possibility of series such as this one being misleading because of heterogeneity of the material. In other words, an appreciable number of very benign tumors may be included, the presence of which in the series makes the course of the true malignant melanoma seem much more favorable than it actually is.

How serious a disease malignant melanoma really is, is best brought out by the 23 cases in this series in which the affected eye was enucleated at or after the age of 60 years. Of these 23 patients, 19 died of metastases and only one of an intercurrent disease. Only three survived

to reach the age compatible with their life expectancy. These figures throw doubt on the widely held concept that immediate enucleation in cases of melanoblastoma of the choroid is indicated in order to prolong life. The authors of the paper under review are interpreting their findings to mean that the prognosis of true malignant melanoma of the choroid is not influenced by enucleation or omission of an enucleation. Removal of a melanoma-harboring, but functionally sound eye seems "unjustifiable." The tumor, however, justifies enucleation once it has destroyed most of the useful vision or has caused glaucoma or pain. (1 graph, 16 references)

Peter C. Kronfeld.

9

GLAUCOMA AND OCULAR TENSION

Adamantiadis, B. **Concerning a case of Posner and Schlossmann's syndrome (glaucomatocyclitic crises).** Arch. d'opht. **17**:573-574, 1957.

The author reviews the observations of Posner and Schlossmann made in 1947 when they reported nine cases of their syndrome which they described under the name "recurrent glaucomatocyclitic crises." He then reports a case considered typical of the syndrome. His patient was a man of 50 years who for the past 13 years had recurrent attacks in the right eye of increased ocular tension associated with keratic precipitates. Atropine was of no value but pilocarpine was found to be useful. After seven years of observation a heterochromia was noted. The clinical course was benign; normal vision and fields were retained, and no synechiae developed. P. Thygeson.

Agarwal, L. P. **The pathogenesis of glaucoma.** Ophthalmologica **134**:310-319, Nov., 1957.

"The controversy between adherents of the neurovascular and those of the mechanical school continues unabated in spite of agreement on many basic aspects." The author bases his views largely on observations of his and others suggestive of systemic vascular abnormalities in glaucoma patients, such as greater capillary permeability and fragility than normal, a higher degree of hemodilution during the water-drinking test than in nonglaucomatous individuals and an inverse venous pressure rhythm. All these abnormalities, according to the author's observations, are corrected by pressure-normalizing ocular surgery. "Glaucoma is a disease connected with a vascular derangement, caused perhaps by an alteration in local axon reflexes, producing some toxins which, in turn, act on the general venous system. The vicious circle of axon reflexes may be broken by glaucoma operations." (5 tables, 24 references)

Peter C. Kronfeld.

Arruga, H. **Cauterization of the wound edges in trepination for glaucoma.** Arch. Soc. oftal. hispano-am. **17**:663-665, July, 1957.

In performing Elliot trepanations for glaucoma Arruga cauterizes the edge of the trephine opening with a cautery below red heat in order to eliminate hemorrhage from the scleral vessels. He noticed that the cauterization also prevented the obliteration of the trephine opening. With its routine use in 32 cases, the opening became closed only in five. The cauterization may be done with a galvanocautery, diathermy electrode or a heated strabismus hook. (1 figure) Ray K. Daily.

Becker, Bernard. **Glaucoma, 1956-1957.** A.M.A. Arch. Ophth. **58**:862-922, Dec., 1957.

This excellent review is characterized by completeness, organization, and readability. (884 references) G. S. Tyner.

Csillag, F. **The effective mechanism of glaucoma operations.** Klin. Monatsbl. f. Augenh. **131**:619-632, 1957.

The author believes that all antiglaucomatous operations are only effective if a choroidal detachment occurs. (1 figure, 55 references) Frederick C. Blodi.

Delmarcelle, J. and Weekers, R. **Disturbances of the ophthalmotonus following ocular trauma (A tonographic and gonioscopic study).** Bull. Soc. belge d'opht. **116**:327-342, 1957.

Routine tonography and gonioscopy was done in a large number of ocular injuries. The findings in 15 eyes with hypotony and in 21 eyes with hypertension were charted in tabular form. Most cases of posttraumatic glaucoma were caused by an increased resistance to the outflow of aqueous; depending on the seriousness of the trauma the hypertension might be permanent or temporary, immediate or late. The posttraumatic hypotension was ascribed to an inhibition of the secretory activity of the ciliary body, which might be transitory or permanent. The possible coexistence of an initial, transitory slowing in the production of aqueous in combination with a permanent definite impairment of outflow is also discussed. The authors call attention to the great danger of the development of glaucoma in eyes with early normal tension and late insidious prolonged hypertension, unnoticed for too long a time. Preventive measures and the medical and surgical basic principles for the treatment of traumatic glaucoma are described. Severe posttraumatic hypotension cannot be influenced successfully and every effort should be made to prevent it. (2 tables, 12 references)

Alice R. Deutsch.

Goldmann, H. and Schmidt, T. **Applanation tonometry.** Ophthalmologica **134**:221-242, Oct., 1957.

The pioneers in applanation tonometry Maklakoff, Imbert and Fick converted their measurements of the flattened area into mm. Hg according to the simple formula $P = W/A$, where P stands for intraocular pressure, W for the weight of the tonometer plunger, and A for the flattened area. The much more refined and accurate applanation tonometer of Goldmann has called for and made possible a much closer and more rigid analysis of all the factors contributing to the result of applanation tonometry. Such an analysis is given in the paper under review.

The principal factors not considered in the formula of Imbert and Fick are the resistance of the cornea to bending and the capillary forces exerted by the fluid ring surrounding the flattened portion of the cornea. Mathematical expressions for these two factors are formulated and checked against empirical measurements made with applanation (cornea-flattening) bodies varying in size, shape, and wettability. By this method, that is by determining the experimental conditions conducive to the best agreement between theory and actual measurement, an optimal technique for clinical applanation tonometry is developed. An applanation area of about 3 mm. diameter turns out to be most desirable. In order to keep the capillary forces reasonably constant a routine procedure of instillation (of the anesthetic as well as of fluorescein) and of cleansing the tonometer must be observed.

Repeated applications of the applanation tonometer to enucleated eyes kept at constant pressure by cannulation show a downward trend of the applanation reading for about five minutes. At the end of that period a plateau is reached. Goldmann and Schmidt attribute this phenomenon to a shift, in relation to each other, of the tissue elements of the cornea under the influence of repeated stresses resulting in a new and different shape of the cornea. Such a phenomenon may be a source of error in tonography.

In cases of corneal astigmatism of high degree in which the flattened surface be-

comes an ellipse instead of a circle, valid measurements of the intraocular pressure may be obtained in a direction approximately half way between the two principal corneal meridians.

The results of applanation tonometry in the hands of Goldmann and associates have been as follows: measurements on 400 normal individuals have yielded a mean of the intraocular pressure of 15.45 ± 2.52 mm. Hg. That means that the intraocular pressure of 99.5 percent of all normal individuals is below 22 mm. The mean of 15.45 obtained with the applanation tonometer is in excellent agreement with the mean obtained with a standard Schiøtz tonometer which is 16.7 mm. according to the 1955 calibration scale. The difference of about 1 mm. is due to the difference in the examinee's position which entails a change in the episcleral venous pressure.

In their summary, which is also a look into the future, the authors express satisfaction with their present method of tonometry as long as it is applied to eyes with average corneal curvature, thickness and texture. Much more fundamental work, however, will have to be done before the applanation method could serve for the purpose of tonography, that is for the determination of the capacity of the outflow channels. A good part of the material presented in this paper may be found in English in the Transactions of the Second Conference on Glaucoma of the Josiah Macy, Jr. Foundation. (13 figures, 8 tables, 11 references)

Peter C. Kronfeld.

Gougnard, L. **The treatment of ocular hypertension with B.C.48. (Bromide of decamethylene-bis-N. methylcarbaminium phenol.** Bull Soc. belge d'opht. **116**:411-415, 1957.

B.C.48 is a new miotic. It is an inhibitor of cholesterinase; its effect on the ciliary muscle is less pronounced than the effect of D.F.P. but it is greater than that of eserine or prostigmine. It causes a vasodilatation of the conjunctival vessels and migration of pigment into the anterior segment of the eye. It was used preferably in 0.2 and 0.3 percent solutions instilled daily. Higher concentrations caused ciliary spasm, severe miosis and headaches. It cannot be purchased on the market as yet. (2 tables, 5 references)

Alice R. Deutsch.

Gurau, Henry H. **Congenital glaucoma.** Iowa St. Med. Soc. J. **47**:680-683, Nov., 1957.

Congenital glaucoma is caused by incomplete cleavage between the cornea and iris. This cleavage is brought about by a difference in growth of different parts of the ciliary body and the outer coats of the eye. The symptoms are photophobia, blepharospasm, and epiphora. Before the age of one year the signs are enlargement and cloudiness of the cornea. Measurement of the ocular tension should be done under general anesthesia. Gonioscopy reveals increased depth of the anterior chamber plus the absence of the angle recess. The treatment is surgical. Goniotomy and goniopuncture, combined or alone, are the operations of choice. (1 table, 9 references) Irwin E. Gaynon.

Higgit, A. C. **Secondary glaucoma.** Brit. J. Clin. Pract. **11**:745-751, Oct., 1957.

The secondary glaucomas are classified in a standard manner and some of the more common types are discussed very briefly as to their etiology, symptomatology, course, diagnosis, and treatment. The importance of carefully examining and following the fellow eye in cases of thrombotic glaucoma is stressed since this form of secondary glaucoma is quite frequently a complication of chronic simple glaucoma. Of 15 patients with thrombotic

glaucoma studied by the author, 11 were found to have simple glaucoma in the fellow eye. (8 figures, 5 references)

William S. Hagler.

Igoshina, N. **Characteristics of the functional condition of the central nervous system in patients in the early stages of glaucoma.** Vestnik oftal. 6:11-17, Nov.-Dec., 1957.

This physiologic study of the neurodynamics was based on the conditioned reflexes using the functional mobility of the visual analyzer or the determination of the threshold of the area of stimulation of the retina.

The study of 30 patients with glaucoma showed changes in the process of mobility of the visual analyzer corresponding to the clinical picture of the disease and the disturbance of the equilibrium of the basic nervous processes or neurotic condition. The disturbance of the reaction of visual analyzer to the change of the illumination was observed in patients with short duration of the glaucoma (from one to six months). In the initial period of glaucoma there is a disturbance of both conditioned and nonconditioned reflexes. (4 figures)

Olga Sitchevska.

Lavergne, G., Weekers, R. and Prijot, A. **A clinical study of scleral rigidity.** Bull. Soc. belge d'opht. 116:298-305, 1957.

Scleral rigidity varies not only in a variety of eye diseases but also in subjects with normal eyes. The determination of scleral rigidity is therefore essential in the evaluation of intraocular pressure. 239 persons were examined and the coefficient of scleral rigidity (K) was established, at 0.0246 ($s = 0.0063$) following Friedenwald's procedures. This value is identical with Friedenwald's values of normal eyes. Open-angle glaucomas did not show any relevant variations in scleral rigidity. In high myopia the scleral rigidity was essentially decreased (0.0156, $s = 0.0054$, and 0.0150, $s = 0.0024$). This fact and the myopic fundus changes and visual field abnormalities make the diagnosis of glaucoma especially difficult. The same is true for thyrotropic exophthalmos; the scleral rigidity was found decreased in two cases, a very important point in the differential diagnosis, in view of the comparatively frequent hypertension in this disease. Iridencleisis does not influence the scleral rigidity while superficial and perforating diathermy and scleral resection reduce scleral rigidity considerably, at least in most cases. (5 references, 6 tables)

Alice R. Deutsch.

Linner, Erik. **Changeability test of aqueous outflow resistance.** Brit. J. Ophth. 42:38-53, Jan., 1958.

In early glaucoma tonography is an aid in diagnosis since studies of outflow reveal a reduced variability of resistance to outflow as compared to the normal. Age apparently is no factor. Outflow coefficients under pilocarpine tend to increase and a decrease is noted when diamox is substituted. The use of ganglionic-blocking agents seems to reduce the effect of diamox and no great change is noted in the eyes in which pilocarpine has been used. The tonography tracings record a decided drop in some instances occurring during the first minute of recording. Because of this a five-minute recording is suggested of which the first minute is discarded. No cause for this effect is known. (4 figures, 6 tables, 62 references)

Lawrence L. Garner.

Mackie, E. Gordon. **Vasomotor factor in glaucoma.** Brit. J. Ophth. 42:1-20, Jan., 1958.

The "vascular" theory of the etiology of glaucoma is stressed and although the theory of interference with outflow is not discarded, evidence is cited which reveals

the strong influence of emotional factors in some instances and suggests a neurovascular origin. After the use of sympathetic blocking agents in patients who could not be controlled by other medical or surgical therapy, a reduction of tension was noted in approximately 50 percent of the cases. The drug was used systemically while all usual therapy was continued. Intravenous medication can usually reduce the tension more dramatically but essentially the results in this series were no better than after oral medication was given. The less obvious emotional causes are described and the advice which should be given to the patient is discussed. (9 figures, 2 tables, 74 references)

Lawrence L. Garner.

Marinchev, V. **Hyaluronidase and intraocular pressure.** Vestnik oftal. **6**:23-28, Nov.-Dec., 1957.

The nature of hyaluronidase and its action as a specific polymerizer of hyaluronic acid are discussed in detail. Hyaluronidase is described as an aggressive factor, while hyaluronic acid serves as a defensive factor in the organism. An equilibrium is maintained between them by the central nervous system. Filatov thought that a disturbance of the equilibrium between them might be one of the etiologic factors of glaucoma.

A study was made by the author of the action of hyaluronidase on increased intraocular pressure in glaucoma. Two Soviet preparations were used: Zonidase and Lidase, both prepared from bulls' testicles and containing highly active hyaluronidase. A 30-percent ointment of Zonidase and Lidase in the form of drops and ampules for subconjunctival injections were used. They were tried first on the eyes of animals and on the author's eyes. No side effects were noted, except of a marked chemosis of the conjunctiva lasting from one to two days when subconjunctival injections were given. The ointment was applied four to five times daily during seven to ten days. Topical application of drops was made every three hours daily for five to six days. This method of treatment was tried on 32 eyes with primary glaucoma and one eye with secondary glaucoma. The age of the 25 patients was from 50 to 80 years; in 14 eyes the ointment was given, in 9 eyes drops, and in 10 eyes, subconjunctival injections were used. There was a lowering of the ocular tension from 10 to 16 mg. in 15 eyes, and from 4 to 10 mg. in 14 eyes. The use of hyaluronidase in combination with miotics and ascorbic acid led to the lowering of the ocular tension in those patients with glaucoma who did not respond to miotics alone; the lowering is of short duration. A 30-percent ointment is well tolerated by the patients and the lowering of the tension is more lasting than with the use of drops or injections. The injection of Lidase is more effective and acts faster and therefore should be used about two days before an antiglaucoma operation is contemplated. (3 figures)

Olga Sitchevska.

O'Day, Kevin. **A case of infantile glaucoma associated with maternal rubella.** M. J. Australia **2**:861-862, Dec. 14, 1957.

The baby's mother had rubella during the sixth or seventh week of pregnancy. The baby had bilateral infantile glaucoma. Goniotomy on each eye successfully controlled the tension. (1 reference)

Ronald Lowe.

Saeteren, T. and Thomassen, T. L. **The escape of aqueous humor after cyclodialysis.** Acta ophth. **35**:372-379, 1957.

The objective of this investigation was to add to the knowledge on the mode of action of cyclodialysis. In eight eyes with simple glaucoma the angle of the anterior chamber was examined by means of gonioscopy, and the episcleral veins studied under the slitlamp and photo-

graphed before and after cyclodialysis. It was found that the pigmentary deposits found in the angle of the anterior chamber in all eyes were unchanged after the operation. Preoperative synechia remained unchanged and anterior peripheral synechia frequently followed the operation. In only two eyes was the angle of the anterior chamber open postoperatively. After cyclodialysis, which reduces the intraocular pressure to physiological values, the postoperative escape of aqueous through the episcleral veins does not differ from that found preoperatively. Inasmuch as the intraocular pressure has been reduced by the operation and the escape of aqueous has remained unchanged the conclusion is that the resistance to the escape has been reduced. (1 table, 30 references) Ray K. Daily.

Sakic, D. **A modification of Lagrange's sclerecto-iridectomy.** Ophthalmologica **134**:62-68, July, 1957.

The operation described is a posterior lip sclerectomy. The scleral incision is started ab externo with a Bard-Parker knife, close and parallel to the upper limbus. Light cauterization of the posterior lip is used to expose the deeper portions of the wound. The final opening into the anterior chamber is made very gently, either by continued scratching or with the "straight" keratome technique. A rectangular portion of the posterior wound lip, measuring 1 mm. in height and 2.5 mm. in width, is excised. A fairly large basal iridectomy is made and the conjunctival incision closed. The operation may be combined with a lens extraction. (1 figure, 15 references) Peter C. Kronfeld.

Salgado-Gomez, E. **The electroencephalogram in glaucoma.** Ophthalmologica **134**:380-386, Dec., 1957.

Electroencephalographic study of a few cases of glaucoma revealed abnormal findings suggestive of a fairly diffuse irritative cerebral process. The findings reported by Hartmann at the International Congress of Ophthalmology in 1954 are essentially confirmed. (8 figures)

Peter C. Kronfeld.

Sanna, Marcello. **Attenuated light in field testing of glaucoma.** Rassegna ital. d'ottal. **26**:101-110, March-April, 1957.

Campimetry at reduced levels of illumination may afford great advantages in exploring for the classical signs of glaucoma. Studies made at the level of 5.5 U. L. have resulted in the demonstration of characteristic changes which are not apparent with normal intensity and this makes possible the recognition of the earliest changes in glaucoma. (6 figures, 12 references) Eugene M. Blake.

Schmerl, Ernst. **Brightness stimuli and diencephalon.** Klin. Monatsbl. f. Augenh. **131**:756-761, 1957.

It has been shown that brightness stimuli are transmitted from the eye and the nose to certain diencephalic centers involved in the regulation of ocular tension. Areas adjacent to the eye or the nose may also transmit such stimuli via the trigeminal nerve. The extract of eye glands of two lobsters was subcutaneously injected into four rabbits. The intraocular pressure rose in these animals for 45 minutes. (2 figures, 10 references)

Frederick C. Blodi.

Sloan, Malachi W. **The importance of early diagnosis in narrow-angle glaucoma.** Henry Ford Hosp. Med. Bull. **5**:245-249, Dec., 1957.

The author summarizes very briefly the different theories to explain glaucoma, and limits his discussion mainly to the mechanical theory for the production of primary glaucoma. He indicates that among 1,184 subjects over 40 years of age who came for routine refraction, routine tonometry found an elevated tension in

46 patients, and glaucoma was established definitely in 31 of them.

The author then emphasizes the mechanical factors involved in narrow-angle glaucoma and the need for a peripheral iridectomy in early cases of this type of glaucoma; this may control the disease for life, if it is done before the development of anterior synechiae. On the other hand, the author feels that only two thirds of the surgical procedures done for wide-angle glaucoma are satisfactory, and that therefore medical treatment with miotics or Diamox should be used as long as the patient does not develop an increasing, uncontrollable tension or field changes. Walter Mayer.

Sobanski, J., Krawczykowa, Z., Szoslandowa, M. and Swietliczko, I. **Glaucoma and its causes.** Ophthalmologica **134**:293-309, Nov., 1957.

In a previous communication (Ophthalmologica 133:81, 1957) the authors described their method of estimating the capacity of the outflow channels and the rate of aqueous formation in the human eye. With Sobanski's ophthalmodynamometer serving as a principal investigative tool, external pressure is applied to the globe and the resultant change in intraocular pressure observed. Lateral pressure (at right angles to the surface of the globe) of a magnitude corresponding to the systolic retinal blood pressure exerted for one minute causes the intraocular pressure to drop at a rate depending upon the capacity of the outflow channels. Applied with a ring-shaped attachment snugly fitting the anterior sclera in the direction of the antero-posterior axis of the eyeball, the dynamometer causes the anterior episcleral veins to collapse and the intraocular pressure to rise at a rate that is dependent upon the rate of aqueous formation.

Tested with these two methods, a large mixed series of glaucomas clearly and uniformly showed reduced capacity of the outflow channels combined with average or even reduced rate of aqueous formation. The interrelationships between the symptoms of glaucoma are analyzed and a new classification of the glaucomas is proposed, distinguishing five principal causes of outflow disturbance, viz. 1. congenital anomalies, 2. intraocular neoplasms, 3. injuries, 4. obviously inflammatory, and 5. apparently noninflammatory processes. Brief reference is made to some long-term observations demonstrating that the glaucomatous optic nerve disease may be "arrested for good" by filtering operations. (8 references)
Peter C. Kronfeld.

Unger, Lothar. **New methods in the conservative therapy of glaucoma.** Med. Klin. **52**:1629-1634, Sept. 13, 1957.

A comprehensive description of diamox medication, indication, contraindication and side effects is given. While diamox brings the pressure down by diminishing the rate of formation of the aqueous, the combination of megaphen, atosil and dolatin as a "cocktail," brings the pressure down without influencing the formation of the aqueous. These drugs have specific affinity to the diencephalon. The oral administration of the "cocktail" combination is the first choice in acute glaucoma to reduce the tension in a very short time but can be used only for short-term therapy before resorting to surgery.
Stephen G. Seech.

Yamamoto, A. **Effect of resection of ophthalmic nerve on ocular tension.** Acta Soc. Ophth. Japan **61**:1509-1516, Sept., 1957.

After blocking the ophthalmic nerve the venae vorticosae were ligated in rabbits. There was a prompt and definite rise in the ocular tension which was followed by a drop of tension beyond the original level in 24 hours. Then there was a grad-

ual rise of tension again in a course of several days to reach a hypertension which was maintained. When the ophthalmic nerve was left intact a simple ligation of the venae vorticosae did not cause hypertension later. On these facts Yamamoto bases a discussion of the regulation of the ocular tension by the trigeminus. (1 figure, 2 tables, 161 references)

Yukihiko Mitsui.

10

CRYSTALLINE LENS

Aguilar Munoz, Jose. **A continuous corneocorneal or corneoscleral suture in cataract operations.** Arch. Soc. oftal. hispano-am. 17:629-641, June, 1957.

The author describes and advocates a continuous silk suture to close the keratotomy wound in cataract extraction. Having used it in 130 cases the author attributes to this suture the elimination of the important surgical and postoperative complications. (3 figures, 9 references)

Ray K. Daily.

Barraquer, Joaquin. **Surgery of the lens.** Arch. Soc. oftal hispano-am. 17:666-698, July, 1957.

This is a comprehensive description of Barraquer's pattern for cataract surgery as practiced at the Barraquer clinic. The preoperative medication comprises pharmacodynamic potentalization which the Barraquers have advocated for several years, steroids as an anti-inflammatory agent, and diamox in cases suspected of hypertension. With the patient in a state of pharmacodynamic potentialization the only local anesthetic used is the instillation of a 10-percent solution of cocaine. In patients under 30 years of age the operation of choice is the extracapsular extraction, which is done in two stages: preliminary extensive discission of the anterior capsule, followed three or four days later by extraction of the intumescent masses through a limbal incision. In some cases an additional capsulotomy with de Wecker scissors later, is needed. Patients over 30 years of age are operated upon by an intracapsular suction extraction and both eyes are done at the same sitting if both eyes are involved. The procedure, described in previous publications, comprises a conjunctival flap, keratotomy with a Graefe knife, multiple subconjunctival corneoscleral sutures of fine silk, a peripheral iridectomy, and tumbling suction extraction with an apparatus which permits regulation of the degree of suction. In monocular cataracts an anterior chamber implant is inserted three months after the operation, when refraction has become stabilized. Subluxated lenses are extracted in the same manner as lenses in the normal position. Dislocated lenses are first fixed from behind with a double needle inserted through the sclera and then extracted. In cases of myopia of over 20 diopters without abnormality of the fundus the lens is extracted. When the fundus is abnormal a lamellar equatorial scleral resection is performed in addition to the cataract extraction. (28 figures)

Ray K. Daily.

Hahn, Jadwiga. **Ectopia lentis in three cases.** Klinika Oczna 27:275-284, 1957.

The author discusses the syndrome characterized by the dislocation of the lens. Etiology, hereditary tendency and symptoms are presented; the possible outcome and necessary treatment are described. In three patients dislocation caused secondary glaucoma and required emergency surgery. Each of these patients reported again to the hospital with the same complication in the other eye within one to two years. Preventative surgery on the second eye should be considered after emergency lens extraction in the first eye.

Sylvan Brandon.

Kirsch, Ralph E. **Further studies on the use of digital pressure in cataract surgery.**

A.M.A. Arch. Ophth. **58**:641-646, Nov., 1957.

By studying the fall of ocular tension which follows the usual retrobulbar injection and digital pressure, the author concludes that five minutes is the optimal length of time to apply digital pressure. He bases this conclusion on the fact that there is little or no drop in intraocular pressure after five minutes. (2 figures, 5 tables, 6 references) G. S. Tyner.

Miyazawa, M. **Stress and experimental cataract.** Acta Soc. Ophth. Japan **61**:1422-1451, Sept., 1957.

In scorbutic guinea pigs, tyrosin (300 mg. daily) or homogentistic acid (20 mg. daily) was given. Nothing happened in the animals. However, when the animals were also given oscillatory stimuli for one hour every day, cataract developed in the course of three weeks. At the same time an excretion of benzoquinone acetic acid in the urine was brought about. An addition of 2.0 mg. of vitamin C daily can prevent the development of such cataract and also the excretion of benzoquinone acetic acid. Miyazawa believes that the stress changes the metabolism of tyrosin and homogentisic acid in the system to produce a cataractogenic substance in scorbutic animals. (4 figures, 5 tables, 30 references) Yukihiko Mitsui.

Pallares, J. **Results of intracapsular extraction by means of the small erisophake.** Arch. Soc. oftal. hispano-am. **17**:642-648, June, 1957.

This is an analysis of the operative and postoperative complications and visual acuity in 150 cases. The improved results compared with a series reported previously are attributed by the author to the combination of technical refinements, which he has gathered from various surgeons. The present technique includes preoperative administration of antibiotics and pharmacodynamic potentialization, local instillation of cocaine and adrenalin, anesthesia of the ophthalmic ganglion with a mixture of novocain, adrenaline and alcohol, irrigation of the conjunctival sac with a solution of mercury oxycyanide, bridle suture of the superior rectus muscle, retraction with lid sutures, fixation of the globe with a three-toothed Barraquer-Llovera forceps after preplacement of sutures, a corneal keratotomy enlarged with scissors, one or two peripheral iridectomies, irrigation of the anterior chamber before applying the suction cup, extraction of the lens with the small erisophake aided by the Arruga hook, avoidance of manipulation of a ruptured lens capsule, additional sutures to firmly close the wound, instillation of an aqueous solution of eserine before tying the additional sutures, cautious use of the spatula and avoidance of putting it into the pupillary or iridectomized space, injection of air into the anterior chamber, irrigation of the anterior chamber during the operation with sodium penicillin 1:1000, avoidance of oily solutions and ointments, removal of sutures of the lids at the first dressing, careful postoperative care including the administration of anti-inflammatory or hypertensive drugs when indicated, sedation during the postoperative period, rest in bed for five days with head and trunk elevated, respiratory and muscular exercises while confined to bed, daily intestinal evacuation after the third postoperative day and, unless definitely indicated, avoidance of too early ambulation. Ray K. Daily.

11
RETINA AND VITREOUS

Alajmo, A. **Further observations on the viscosity of the subretinal fluid in idiopathic detachment of the retina, and a few clinical aspects of the disease.** Arch. di ottal. **61**:185-208, May-June, 1957.

In 30 cases of idiopathic retinal detachment, the viscosity of the subretinal fluid

was tested and correlated with: 1. the tendency to reattach with preoperative bedrest, 2. the magnitude of the detachment, 3. the extent of retinal tears, 4. the refraction, 5. postoperative result. Postoperative results were good in 18 cases. There appeared to be no prognostic importance in the viscosity of the subretinal fluid. There was no correlation in the other factors tested. The extent of reattachment of the retina with bed rest had no prognostic influence. (8 tables)

Paul W. Miles.

Alearts, L. **Retinal examination in monochromaic light.** Bull. Soc. belge d'opht. **116**:283-287, 1957.

Pure monochromatic light has never been used previously in ophthalmoscopy. The red-free light of Vogt is a light devoid of red but not entirely monochromatic. The light source used by the author consists of a vapor lamp of 400 volts-85 watts. The main elements of this light are three pure colors, namely yellow, green and blue; as these colors are in the short wave length end of the spectrum they are easily separated by filters. In combination with the slitlamp a most impressive outline of the retinal relief can be demonstrated. Goldman has shown that under focal illumination the retina can be divided into three planes, namely, the retinal band corresponding with the anterior limiting membrane; the pigment band, coinciding with the pigment epithelium and the scleral band behind the choroid. Pathologic changes on the retinal surface and in the retinal transparency constitute variations which are characteristic for specific fundus diseases and are much more pronounced and much easier to see in yellow light. Capillaries also stand out more distinctly. Different grades of retinal edema and shape and location of exudate and hemorrhages are seen better in yellow light, while the pattern of the nerve fibers is more evident in green light. Monochromatic light also can be useful in the differential diagnosis of early central retinal detachment and cystic degeneration of the macula. Monochromatic illumination in binocular biomicroscopy of the fundus is easier because a contact lens is not necessary. Mild retinal edema is clearly visible early.

Alice R. Deutsch.

Burton, T. Y., Kearns, T. P. and Rynearson, E. H. **Diabetic retinopathy following total pancreatectomy.** Mayo Cl. Proc. **32**:735-739, Dec. 25, 1957.

A patient who had a total pancreatectomy, developed diabetic retinopathy ten years following surgery. Such retinopathy may develop in total absence of the pancreas. In this case there was no family history of diabetes and the blood chemistry was almost normal. (1 table, 6 references)

Irwin E. Gaynon.

Csapody, I. **The treatment of macular holes with retrobulbar amnion implants.** Ophthalmologica **134**:272-276, Oct., 1957.

The report concerns four cases of retinal detachment in which an amnion implant, in the author's interpretation, contributed materially to the final complete reattachment of the retina. In the first case, a 14-year-old imbecile, blind in the other eye from the same disease, the original picture was that of very wide-spread peripheral degeneration with a hole in the macula. The first operation consisted in surface coagulation over the upper periphery plus three semi-perforating coagulations around the posterior pole. The retina reattached for a while but then came loose again, apparently because of new peripheral tears which were treated in a second diathermy operation. When, after another temporary improvement, a new break developed at the temporal border of the disc, in the immediate vicinity of two chorioretinal scars after coagulations, the author began to suspect an injurious

effect of the diathermy. The third operation, therefore, was performed entirely without diathermy and consisted only in an amnion implant, that is of wrapping a triangular piece of amniotic membrane around the optic nerve. No sclerotomy of any kind was done although there was abundant subretinal fluid. One week later the retina had returned to its normal position and the tear had become closed and almost invisible. "This case proves that closure of the break without release of subretinal fluid can result in a complete cure of a large retinal detachment. The case also proves that the amnion implant can be very effective in cases of breaks in most unfavorable locations. The patient reads medium-size print."

In the second case a macular hole had remained open despite two well-aimed diathermy operations. Six weeks after the amnion implant the hole was closed and the retina back in normal position.

In the third case the macular hole was not recognized until the retina flattened out somewhat as the result of a diathermy operation for closure of a peripheral break. In this case the amnion implant was combined with a posterior sclerotomy to release some of the subretinal fluid. The post-operative course was complicated by a retrobulbar and intraocular purulent infection which responded to antibiotics and, fortunately, did not interfere with complete and lasting reattachment of the retina.

The amnion used in these cases was obtained under sterile conditions by cesarean section and stored in the refrigerator for a few days. (2 figures, 4 references) Peter C. Kronfeld.

DeMello Oliveira, H. and Lania, L. **Retrolental fibroplasia.** Arq. brasil. de oftal. **20**:196-206, 1957.

Retrolental fibroplasia is rarely seen in Brazil. This is the case history of a four-months-old infant, born prematurely, who was found to have the condition in an advanced stage in both eyes with complete detachment of the retina in one eye and vitreous hemorrhage in the other. A brief review of the condition in general is presented. (15 references) James W. Brennan.

Esente, I., D'Aprile, V. and Rossi, U. **Amaurotic familial idiocy.** Gior. ital oftal. **10**:16-25, Jan.-Feb., 1957.

A case of Tay-Sachs disease is described in detail. Stress is laid on the hypotony of muscles and the patient's indifference to his surroundings. There was also progressive amblyopia which had not reached complete blindness when the patient died before she was two years of age. There was no family history of the disease or of consanguineous marriages. (10 references) V. Tabone.

Jensen, Per. **Seasonal variations in detachment of the retina.** Acta ophth. **35**: 113-114, 1957.

More cases of retinal detachment were treated in Oslo for a ten year period in summer than in any other season. After deducting traumatic cases and others where cataract surgery or disease could be held responsible, 369 cases remained. There was a statistically significant rise during the summer months. (1 figure, 5 references) John J. Stern.

Livingston, Philip, **Amaurosis fugax.** Lancet **2**:1129-1132, Dec., 7, 1957.

Amaurosis fugax is a condition which causes blindness (monocular or binocular, photopic or scotopic) and in which recovery is complete enough to cause no subjective residue. Angiospasm is the most common cause, with or without arteriosclerosis. It can follow local anesthesia near the lingual nerve in dental work. It can be due to contrecoup head injuries, starvation, demyelinating disease, hysteria, migraine, pregnancy, tu-

mors of the orbit or globe, cardiac disease, glaucoma, carbon monoxide poisoning, and diabetes. In each case the ophthalmologist can be useful in determining the significance of the symptom, and the need for vasodilators to restore retinal circulation. Paul W. Miles.

Shelburne, S. A. **The retina in hypertensive disease.** Ann. Int. Med. **47**:1154-1164, Dec., 1957.

The essential fundus changes in hypertension are found in the arterioles. In evaluating a patient with this condition, the author directs the attention of internists to the three lesions peculiar to hypertensive disease: 1. definite and moderate arteriovenous nicking, 2. marked segmental constriction of the arterioles, 3. marked generalized constriction of the arterioles. Other changes, such as hemorrhages, exudates, sheathing, or loss of light streak, may be seen in other conditions and should not distract the physician's primary attention from the arteriolar lesions. The use of complicated classifications or vague terms, such as copper wire effect, is discouraged. (6 figures, 3 tables, 13 references)

Edward U. Murphy.

Sobhy, M. **A case of funnel-shaped retinal detachment cured by replacement of the vitreous and scleral resection.** Ophthalmologica **134**:111-112, Aug., 1957.

As far as can be judged from the brief description, the detachment was total, funnel-shaped and rigid. The vision was perception of light and of hand movements. The other eye of the 20-year-old male patient was blind from retinal detachment. Surgery was undertaken "without any guarantee of success." In the first step, called replacement of vitreous, the subretinal fluid was released by posterior sclerotomy and an intravitreal injection of some of the patient's own spinal fluid was made to restore the ocular tension to about normal. The operation improved the position of the retina as well as the conditions of ophthalmoscopic visibility. A retinal break in the upper temporal quadrant could be recognized and localized. In the second operation, five weeks after the first, closure of the break by electrocoagulation was combined with a 2 mm. lamellar scleral resection "in the temporal region." The retina was reattached completely with a visual acuity of 4/60.

Peter C. Kronfeld.

12

OPTIC NERVE AND CHIASM

DeVincentiis, M. **The probability of viral etiology in cases of retrobulbar optic neuritis.** Arch. di ottal. **61**:209-216, May-June, 1957.

Optic neuritis of toxic, infectious and metabolic origin is discussed. It had been suggested that sudden brief attacks of retrobulbar optic neuritis might be of viral origin. The disease could be otherwise subclinical but from a neurotropic virus. In a series of 11 cases of retrobulbar neuritis without other signs, complement fixation or other laboratory tests were done for encephalitis of the Japanese B type, the oriental equine, the occidental equine, the St. Louis type, rabies, and from mumps. Intracerebral inoculations of various laboratory animals was done. There was no indication that these 11 cases had a specific virus infection.

Paul W. Miles.

Piper, H. F. and Unger, L. **Inferior hemianopsia due to circulatory disturbances affecting the optic nerve.** Ophthalmologica **134**:169-180, Sept., 1957.

Circulatory disturbances affecting the distal, lamina-near portion of the optic nerve give rise, in a significantly high percentage of cases, to an inferior hemianopsia. The predominance of inferior field or superior optic nerve lesions may

be due to the fact that the anterior branch of the central artery of the optic nerve terminates in the upper portion of the nerve, above the axially located central retinal artery. Two pertinent cases are reported in detail. (3 figures, 38 references) Peter C. Kronfeld.

Roper-Hall, M. J. **Optic disc oedema in the absence of raised intracranial pressure.** Brit. J. Ophth. **42**:91-98, Feb., 1968.

Five cases of pappiledema are described, all of which occurred with normal intracranial pressure. The author suggests that a gradual decrease in nutrition and oxygen supply can result in edema while function remains intact, which is known to occur in partial venous obstruction or malignant hypertension. (1 table, 27 references) Lawrence L. Garner.

White, L. E. and Foltz, E. L. **Optic atrophy as an isolated sign of unruptured carotid aneurysm** Neurology **7**:803-805, Nov., 1957.

"Progressive unexplained optic atrophy with irregular visual field changes should suggest the diagnosis of internal carotid aneurysm. Carotid arteriography establishes the diagnosis. Internal carotid artery ligation can lead to complete recovery of visual loss in early cases and moderate or marked improvement in late cases." (1 figure, 23 references) Irwin E. Gaynon.

13

NEURO-OPHTHALMOLOGY

Alfano, J. E. **Clinical lesions of the oculomotor nerve.** Illinois M. J. **112**:219-222, Nov., 1957.

The author presents a clear and concise discussion of third cranial nerve disease. The anatomy is described and the possible sites of lesions along the course of the nerve and in its nucleus are outlined. The probable etiologies and clinical signs and symptoms are mentioned and oculomotor nerve ophthalmoplegia differentiated from myasthenia gravis and chronic progressive ophthalmoplegia externa. Edward U. Murphy.

Bergman, P. S. **Cerebral blindness: analysis of twelve cases with especial reference to the electroencephalogram and patterns of recovery.** A.M.A. Arch. Neurol. & Psychiat. **78**:568-584, Dec., 1957.

In cerebral blindness there is bilateral absence of light perception caused by disease of the cerebral hemispheres. Lesions are retrogeniculate, and pupillary light reactions are normal. There is always other evidence of bilateral cerebral disorder. In five cases the cause was vascular occlusion. There were one each of cerebral venous occulsion, progressive encephalopathy, Hodgkin's disease, carbon monoxide poisoning, trauma, intracranial hemorrhage with hypertension and nephritis, and recent arterial occlusion on one side and trauma to the other. In two cases, the onset of blindness was gradual. In five cases, vision returned to some degree. Every patient had neurologic signs and mental changes. Denial of blindness was common. An EEG showed absence of occipital alpha activity, and absence of photic driving. In those who recovered vision, light returned first in the central area, with inequality of the two homonymous half-fields. All patients were unable to perceive their eye position, and had poor gaze movements on command. Vision was apparently necessary to ocular position sense in the cases where the latter did improve. No patient showed optokinetic nystagmus.

Visual loss from cerebral lesions is not simply the result of cut cortical fibers in the brain, but is also quantitative in that the normally acute central vision is the last to be destroyed and the first to recover. Macular vision could be split for color and spared for form and vice versa. (5 figures) Paul W. Miles.

Deutsch, Alice B. **Monocular internal ophthalmoplegia: three case reports.** Tennessee St. M.A.J. **50**:454-455, Nov., 1957.

Monocular paralytic mydriasis is always of significance and deserves careful diagnostic study. The mecholyl test of Scheie is essential in the differential diagnosis of Adie's syndrome. The third cranial nerve may also be injured by diseases of the posterior cerebral, posterior communicating and the superior cerebellar artery. Unilateral mydriasis may be caused by destructive, inflammatory, vascular, and degenerative lesions of the various tissues that are in contact with the third cranial nerve. (2 references)

Irwin E. Gaynon.

Friedman, A. J. **The Marin Amat syndrome.** Los Angeles Neurol. Soc. **22**:145-148, Sept., 1957.

The case of a 72-year-old Caucasian woman with a typical Marin Amat syndrome (inverted Marcus Gunn phenomenon) is presented. Some three years previously this patient had a rather sudden onset of contraction of the left frontalis and orbicularis muscles upon closure of her mouth during the act of mastication. This narrowing of the palpebral fissure could not be reproduced by opening of the mouth, deviation of the mandible to either side, or by grinding of the teeth. There was no history of trauma or any acute episode of illness prior to the onset of the condition, and the remainder of the neurological examination was completely negative. There was no evidence or history of recent or old paralysis or spasm of the facial nerve. Since there had been no known lesion of the fifth or seventh nerve it seems unlikely that this phenomenon could be explained by the theory of "misdirected regeneration" of the peripheral nerve fibers. It is postulated that the syndrome in this case resulted from some type of disturbance of "intrinsic nuclear function" which well may have been due to a punctate thrombotic lesion. (2 pictures, 2 references)

William S. Hagler.

Hollenhorst, R. W., Stein, H. A., Keith, H. M. and MacCarty, C. S. **Subdural hematoma, subdural hygroma and subarachnoid hemorrhage among infants and children.** Neurology **7**:813-819, Dec., 1957.

Intraocular hemorrhage, usually bilateral, is the most common finding in subdural and subarachnoid hemorrhage. The presence of intraocular hemorrhage is not related to the severity of the presenting symptom; next in frequency was palsy of the oculomotor and abducens nerve. Trauma is the chief cause. (9 tables, 24 references)

Irwin E. Gaynon.

Urrets-Zavalia, A., Jr. and Remonda, C. **Congenital ocular motor apraxia.** Ophthalmologica **134**:157-169, Sept., 1957.

The physiology and pathology of conjugate ocular movements is reviewed. Lesions affecting only the frontal center of gaze or its descending pathway are fairly common, in contrast to lesions of only the occipital motor center or its descending pathway, which are extremely rare. A case is reported in which such a lesion may have been present, in addition to a midbrain lesion. A 43-year-old woman suddenly came down with diplopia, drowsiness and a splitting headache. The laboratory tests pointed toward an inflammatory process, that is, encephalitis. The salient eye findings were paralysis of convergence, almost complete loss of the light reactions but well preserved near reactions of the pupils; the diplopia proved to be due to a pre-existent esophoria of six prism diopters suddenly made insuperable by a complete loss of fusional movements. The loss of the latter also manifested itself in the form of irregularity and unevenness of guided or following movements. Unfortunately, the

case could only be observed for two weeks during which period no essential change occurred in the clinical picture.

After this "digression" the authors turn to the detailed description of a new case of congenital ocular motor apraxia, the entity first described by Cogan and Adams (Arch. of Ophth. 50:434, 1953) and characterized by 1. inability to perform command or guided conjugate movements in the horizontal plane, 2. compensatory head jerks which make up partially for the oculomotor defect, and 3. spontaneous, roughly pendular and apparently aimless conjugate side-to-side movements. The disturbance in the case reported was slightly asymmetrical in the sense that levoversion was more inhibited than dextroversion. Since the presentation of this case before the Ophthalmological Society of Cordoba (Argentina) in October, 1955, two more cases of this entity have been reported (cfr. Alfano, Ophth. 40:724, 1955 and Reed and Israels, Brit. J. Ophth. 40:444, 1956). (2 figures, 1 table, 13 references)

Peter C. Kronfeld.

14

EYEBALL, ORBIT, SINUSES

Vancea, P. **Bilateral orbital cysts with apparent anophthalmos.** Ophthalmologica **134**:405-409, Dec., 1957.

In a three-weeks-old infant congenital orbital cysts caused symmetrical bulging and tightness of the lower lids. Retraction of the upper lids revealed a diverticulum-like cavity lined with conjunctiva but no signs of an eyeball. The right orbit was explored under local anesthesia. An oval cyst was found narrowing down in the back to a matchstick-like pedicle. Three days later the infant died of subacute glomerulonephritis. Histologically, several different types of cells could be identified in the wall of the cyst, strewn together in a haphazard fashion. In some areas rudiments of retinal or choroidal structure could be recognized. The blood vessels in the wall of the cyst showed signs of chronic inflammation. The author attributes the cyst to developmental arrest occurring during the stage of the primary optic vesicle. According to this view, the cyst arose from the distal portion of optic peduncle, probably as a result of an inflammatory process which was still in evidence three weeks after birth. (4 figures, 4 references) Peter C. Kronfeld.

15

EYELIDS, LACRIMAL APPARATUS

Jonkers, G. H., Leffertstra, L. J. and Rademakers, J. M. **Vitallium tube implants in the treatment of stenosis of the nasolacrimal duct.** Ophthalmologica **134**: 347-348, Nov., 1957.

Results of 24 vitallium tube implants after La Rocca (Arch. Ophth. 39:657, 1948) are reported. In seven cases the tube was extruded, and in one case it had to be removed surgically. Eight of the remaining 16 patients required an additional dacryocystorhinostomy for the relief of the tearing. In some of the remaining cases the epiphora recurred but the patient refused further surgery. In only about 10 percent could the operation be described as lastingly successful. "The percentage of failures is much higher than in a well performed Toti or Dupuys-Dutemps operation." (2 references)

Peter C. Kronfeld.

Samuelly, C. **A contribution to the knowledge of congenital lacrimal fistula.** Arch. di ottal. **61**:279-284, May-June, 1957.

In a boy, aged 13 years, a unilateral lacrimal sac fistulous tract was removed and studied histologically. The absence of inflammatory changes suggested that the cause of the anomaly may have been an intrauterine dacryocystitis. (2 figures.)

Paul W. Miles.

Weiner, H. L. **The nonsurgical treatment of dacryostenosis.** Albert Einstein Med. Center J. **6**:17-19, Dec., 1957.

A number 3 Bowman probe is passed into the nasolacrimal duct to re-establish continuity of the duct; 0.5 cc. of neomyacincortisone ointment that has been warmed is injected to prevent closure of the stricture and allow for epithelialization. The treatment may be repeated after seven days. The results have been successful in more than 50 percent of cases after one to six treatments. (1 figure, 8 references) Irwin E. Gaynon.

16

TUMORS

Blatt, N., Regenbogen, L., Athanasiu, M. and Abramovici, F. **Craniofacial neuroangiomatosis with serious ocular involvement.** Ophthalmologica **134**:81-96, Aug., 1957.

The authors record a case of very extensive angiomatosis involving skin and mucous membranes on the left side of the head of a 19-year-old male patient. The eye participated in the form of an angioma of the choroid with secondary retinal detachment. There were no clinical or radiological signs of central nervous system involvement. The many variations of craniofacial angiomatous malformations are tabulated and discussed. (11 figures, 2 tables) Peter C. Kronfeld.

17

INJURIES

Copper, A. C. **Orbito-cranial stab-wounds.** Ophthalmologica **134**:366-372, Nov., 1957.

The characteristic features of orbito-cranial stab injuries are reviewed. The external wound may look very insignificant and the signs of cranial injury may be entirely absent during the first 24 hours. A careful history, that is an analysis of the circumstances under which the injury took place, may give important clues. The usual antero-posterior or postero-anterior roentgenogram may fail to reveal the fact of penetration of the orbito-cranial wall. Four illustrative cases are reported. Close cooperation with the neurosurgeon is essential in most instances. (13 references)

Peter C. Kronfeld.

18

SYSTEMIC DISEASE AND PARASITES

Appelmans, M., Michiels, J., Walgravens, A. and Dojen, N. **Ocular manifestations of the syndrome of Lowe.** Bull. Soc. belge d'opht. **116**:311-321, 1957.

The syndrome under discussion was described by Lowe, Terrey and MacLachtan in 1912. It is characterized by an insidious type of rickets, refractory to vitamin therapy. Other manifestations are amino aciduria, mental retardation, buphthalmos and cataract. Related syndromes from which the Lowe syndrome should be differentiated are cystinosis or Lignac syndrome, a metabolic disturbance of the amino acids with precipitation of cystein in the cells of the reticulo-endothelial system and the cornea; and the Fanconi syndrome, distinguished by a triad of symptoms, namely, glycosuria, hyperphosphaturia and hyperamino-aciduria. Two cases in children are discussed in detail. The multiple ocular and extra-ocular malformations are ascribed to a severe metabolic disturbance early in pregnancy. The possible relationship of disturbances of enzyme activities, abnormal chemical transformations, development of cataracts and manifestations of various ocular and cerebral malformations are discussed. A large percentage of patients with congenital cataract were found to have an amino aciduria. (2 figures, 17 references) Alice R. Deutsch.

Esente, I. **Congenital toxoplasmosis in an infant.** Gior. ital. oftal. **10**:33-50, Jan.-Feb., 1957.

A male infant, three months of age, is described who had congenital toxoplasma infection. The fundi showed areas of chorioretinopathy at the posterior pole and signs of endophthalmitis. There were also numerous foci of intracranial calcification. At postmortem examination the toxoplasma was found in the cerebral foci, there was evidence of a diffuse meningoencephalitis and a reduction of the brain tissue. The serum reaction of toxoplasma was negative. (11 figures, 47 references) V. Tabone.

Lemos da Silva, J. L. **The incidence of tropical ocular diseases in the States of Sao Paulo, Mato Grosso and Parana.** Arq. brasil. de oftal. **20**:163-181, 1957.

This article reports the ocular complications of leishmaniasis, leprosy, pemphigus foliaceus, malaria, myiasis, variola, and varicella which have been observed in these three states in Brazil. (35 references) James W. Brennan.

McCullagh, E. P., Clamen, M. and Gardner, W. J. **Clinical progress in the treatment of exophthalmus of Graves' disease, with particular reference to the effect of pituitary surgery.** J. Cl. Endocrin. and Metab. **17**:1277-1292, Nov. 1957.

Exophthalmus fails to improve or becomes worse in 40 percent of patients after the control of hyperthyroidism. Exophthalmus is believed to be due to a hypersecretion of thyroid-stimulating hormone. Orbital decompression is the procedure of choice where there is serious danger of loss of the eyes without immediately effective treatment. The suppression of pituitary hyperactivity by the use of ACTH and hydrocortisone, or by the surgical cauterization of the pituitary gland with section of the stalk, resulted in hypopituitarism and improvement of exophthalmus. (10 figures, 1 table, 20 references) Irwin E. Gaynon.

Paufique, L. and Guinet, P. **Retinovitreal hemorrhages and cataract in prediabetic states.** Ann. d'ocul. **190**:797-811, Nov., 1957.

The authors report eight cases of retinovitreal hemorrhage and five cases of cataract (chiefly posterior subcapsular) in young adults in whom all attempts to find an etiology were fruitless. However, in seven cases there was a family history of diabetes and for this reason a carbohydrate tolerance test was given to all. In every case there was an abnormal rise in blood sugar and a prolongation of the hyperglycemia curve. The patients with retinovitreal hemorrhages responded to strict dietary management and irradiation of the pituitary. The authors feel that these patients represent a prediabetic state which must be searched for in all young adults with unexplained retinal hemorrhages or cataracts. The method suggested is the carbohydrate tolerance test. (12 references) David Shoch.

Smiley, W. K., May, E. and Bywaters, E. G. L. **Ocular presentations of Still's disease and their treatment: iridocyclitis in Still's disease; its complications and treatment.** Ann. Rheumat. Dis.**16**:371-383, Sept., 1957.

One hundred and eighty three children with Still's disease admitted to a national center for juvenile rheumatism were carefully studied for evidence of ocular manifestations and followed for a period of from one to nine years. Eleven patients (6 percent) were found to have one or both eyes affected. One patient had the onset of his eye disease several years prior to any evidence of systemic disease.

The primary lesion, an iridocyclitis, was present in all cases, and was bilateral in seven of the patients. In all of these it was of the typical nongranulomatous type and was characterized by chronicity, extreme insidiousness, and the tendency to recur. Complicated cataracts, band keratopa-

thies, vitreous opacities, secondary glaucoma, and hypotony leading to phthisis bulbi were seen as complications of the iridocyclitis. Steroids were used in most patients for prolonged periods with variable results.

Band keratopathy was present in nine of the 18 eyes with iridocyclitis and was never found in the absence of iridocyclitis. In one case this began while the eye was under observation and its development is described. This keratopathy is progressive in nature and in two cases was observed to progress even after all evidence of iridocyclitis had subsided during steroid therapy. In no case was the band observed to regress.

In eight of the patients with band keratopathy the serum calcium was determined on many occasions and was always found to be within normal limits. It is therefore postulated that the calcium salts are deposited in the superficial cornea because of increased permeability of the limbal vessels combined with a subsequent loss of carbon dioxide. The higher serum phosphorus levels which occur in children may contribute to this deposition. In four eyes the corneas were treated with the chelating agent EDTA with such good visual and cosmetic results as to suggest that keratoplasty would be unjustifiable.

Cataracts were found in only two cases (four eyes) of the series, and they were all of the typical complicated type and matured rapidly. Three of these were needled with fairly good visual results in two. (12 figures, 2 tables, 48 references)

William S. Hagler.

Stucchi, C. **Ocular manifestations of collagen diseases. Transitional forms.** Ophthalmologica **134**:1-20, July, 1957.

The nucleus of the paper is a clinical study of one case of ankylosing spondylitis with recurrent uveitis, one case each of Reiter's syndrome, Stevens-Johnson's syndrome and of pemphigus and two cases of Behçet's syndrome. The author points out the close relationships between these diseases and recommends their inclusion under the heading of collagen diseases. (1 figure, 101 references)

Peter C. Kronfeld.

Wagener, Henry P. **The ocular lesions of pulseless disease.** Am. J. M. Sc. **235**: 220-234, Feb., 1958.

Pulseless disease is defined as a syndrome occurring in individuals less than 40 years of age in whom there is an occlusion in the main branches of the aortic arch due to nonspecific arteritis. Of 81 cases in the literature, 73 were in women. Transient blurring or loss of vision was an early sign. There was usually visible fragmentation of the blood stream in the retinal vessels with the patient in standing position. Late changes included neovascularization in the retina and iris, formation of arteriovenous anastomoses in the retina, and cataract. Long term anticoagulant therapy is suggested. (94 references)

Paul W. Miles.

Weekers, R. and Lavergne, G. **A new symptom of thyrotropic exophthalmos.** Ophthalmologica **134**:276-282, Oct., 1957.

The authors are practicing Friedenwald's method of estimating ocular rigidity by taking, at each examination, three tonometric readings with each weight in alternating fashion viz. 5.5, 10, 5.5, 10, 5.5, and 10. The means of the readings with each weight are recorded. These examinations are repeated under reasonably constant conditions on three to five consecutive days. The mean ocular rigidity of 239 normal individuals tested in this manner was found to be .0246; the extreme variants were .0100 and .0400. In one case of apparently thyrotropic exophthalmos the ocular rigidity was found to be .0117 in one eye and .0093 in the other. This low

ocular rigidity partly concealed a coexistent state of elevated intraocular pressure with early fiber bundle defects. In another case of bilateral exophthalmos, oculomotor disturbances, but without any history, or symptoms of thyrotoxicosis, the ocular rigidity was also low.

"One is tempted to conclude that low ocular rigidity is a manifestation of imbibition of the sclera analogous to the conjunctival chemosis." Since thyrotropic exophthalmos fairly frequently causes disturbances of the ocular fluid exchange the correction of the tonometric readings for variations in ocular rigidity is of particular importance. (1 figure, 2 tables, 4 references) Peter C. Kronfeld.

19

CONGENITAL DEFORMITIES, HEREDITY

Giacomelli, P. **A case of congenital anopthalmos.** Gior. ital. oftal. **10**:67-76, Jan.-Feb., 1957.

A child, five days old, is described who had congenital anophthalmos on the right side and a large cyst of the lower lid. The literature is reviewed. (3 figures, 40 references) V. Tabone.

20

HYGIENE, SOCIOLOGY, EDUCATION, AND HISTORY

Amsler, M., Arruga, H., Berg, F., Duke-Elder, S., Onfray, R., Ovio, G., Pillat, A., Rintelen, F. and Zeeman, W. P. C. **Contributions to the history of ophthalmology.** Ophthalmologica **134**:6-119, Supplement 1957.

In this testimonial issue of Ophthalmologica dedicated to Arthur Brueckner on the occasion of his 80th birthday the above-named authors take up chapters in the history of ophthalmology in which their respective home countries played a prominent part. Written in different styles and from different viewpoints this testimonial number makes fascinating reading, despite its lack of organization or coherence. Peter C. Kronfeld.

Falkowska, Zofia. **Binocular vision in photogrammetry workers.** Klinika Oczna **27**:591-602, 1957.

Photogrammetry requires very well developed stereoscopic vision with good and exactly equal vision in both eyes without optical correction. Before accepting a boy for apprenticeship he was tested for muscle balance, stereoscopic vision, degree of vision, amplitude of accommodation, retinal rivalry and visual fatigue. Experience showed that students with wider interpupillary distance had better stereoscopic vision than those with a short distance. General health had great influence on the performance of workers, any disturbance of it increasing the number of mistakes at work. About 40 percent of the individuals examined failed to qualify or dropped out because of inadequacy. The experience was based on examination of 230 individuals over a period of a few years. (7 figures, 20 references) Sylvan Brandon.

Lépine, B. **The Ophthalmologic Institute of Phnom-Penh and its functioning.** Arch. d'opht. **17**:567-572, 1957.

The Institute of Ophthalmology of Phnom-Penh in Cambodia was instituted in 1926, pillaged in 1944 at the time of the Japanese occupation, and subsequently reopened by the post-war French administration. It has 60 beds, plus an outpatient department, and during a 15-months period 19,000 patients were seen for 60,000 consultations. During this period 1,030 patients were hospitalized. Surgical procedures for entropion were first in frequency, reflecting the high incidence of trachoma in the population. Cataract extraction was the second most frequently performed operation. It is of interest that only 21 antiglaucomatous operations were performed, only one opera-

tion for retinal detachment, and only eight operations for strabismus, as against 172 for cataract and 344 entropion procedures. The author comments on the frequency of trachoma, (around 50 percent of the population) seasonal conjunctivitis (Koch-Weeks), and corneal ulceration, and notes the infrequency of glaucoma and retinal detachment. He comments on the infrequent requests for refraction. The Institute has recently been modified to provide air-conditioning and modern plumbing. The School of Medicine has utilized its facilities for teaching purposes.

P. Thygeson.

Salvisberg, H. **The Credé method of prophylaxis. Its development. Review of current methods.** Ophthalmologica **134**:7-33, Supplement 2, 1957.

This paper is, essentially, an analysis of the answers of 34 European eye clinics to the following questions: 1. the technique of prophylaxis in current use, 2. the incidence of gonoblennorrhea and of inclusion blennorrhea on the regime listed under 1, 3. the incidence of irritative, chemical conjunctivitis on the regime stated under 1, 4. the incidence of gonoccal infection in pregnant women as discovered by the department of obstetrics at the time of delivery, and 5. the respective eye clinics opinion concerning the most effective prophylactic technique.

The answer to question one was that 17 clinics used either silver nitrate or acetate, eight clinics colloidal silver preparations, seven clinics penicillin, one clinic zinc sulphate and one clinic no prophylaxis at all. A total of 11 cases of gonoblennorrhea was observed in the 34 clinics during a two-year test period. The incidence of these cases showed no correlation with the type of prophylactic agent used, except for the probably significant figure of three cases of gonoblennorrhea in the one clinic which used no prophylactic agent at all. The only three cases of inclusion blennorrhea which were diagnosed and reported occurred in one of the clinics that used penicillin as a prophylactic agent.

Critical evaluation of the opinions expressed by the staff of the 34 clinics leads to several definite conclusions. Abandonment of all prophylactic measures which has been suggested by some authors, "is out of the question." Silver nitrate or acetate is a strong irritant and does not afford complete protection. The colloidal silver preparations have very limited bactericidal property and are chemically unstable. Serious objections to the use of penicillin are the possibilities of sensitization of the infant and of acquired resistance of more and more bacterial strains. A quaternary ammonium base named Desogen (Geigy) may have advantages over all prophylactic agents used at present. Silver nitrate or acetate, in the authors's opinion, is the second best agent. (83 references) Peter C. Kronfeld.

Schoenenberger, F. **The prophylaxis of ophthalmia neonatorum with Desogen (Geigy).** Ophthalmologica **134**:33-48, Supplement 2, 1957.

Desogen is a quaternary ammonium base closely related to Zephiran and phemerol. It is widely used on the continent as a disinfectant. In the study under review the bacteriostatic and bacteriocidal property of Desogen was tested in vitro against representative strains of gram-positive and gram-negative organisms. The agent proved effective against staphylocci in .02 percent, against pneumococci in .05 percent, and against gonococci in .01 percent concentration, respectively. Instilled into the conjunctival sac in 0.5 percent strength it is non-irritating and maintains in the area a demonstrable bacteriostatic effect for about five minutes. In a series of 310 consecutive newborns in which it was used as a prophylactic agent only one case of blennorrhea occurred in an infant with congenital

dacryostenosis. Enterococci, streptococcus viridans, Escherichia coli and Morax-Axenfeld diplobacilli were identified in the conjunctival secretions. After one probing of the nasolacrimal duct and Desogen instillations every three hours for one day, the conjunctival smear became normal. The author recommends Desogen in 0.5 percent aqueous solution as the agent of choice in the prophylaxis of ophthalmia neonatorum. (11 tables, 26 references) Peter C. Kronfeld.

Uchoa, P. **The problem of trachoma in Ribeirao Preto.** Arq. brasil. de oftal. **20**: 190-195, 1957.

This is a statistical analysis of trachoma in the municipal town of Ribeirao Preto in Brazil during the ten-year period from 1943 to 1953. Although the number of patients seen in the dispensaries increased almost three fold in that decade, the number of patients with evidence of trachoma decreased; the incidence dropped from 19.4 to 5.5 percent. Of the trachomatous patients seen in 1953, 34 percent were considered to have an active form of the disease; the others were considered clinically cured. The greatest frequency was observed in the age group from 15 to 24 years. Males were affected more than females, laborers more than farmers or office workers. The importance of hygiene is stressed in the campaign to eradicate this serious disease.

James W. Brennan.

Vogel, Friedrich. **The eugenic consideration of retinoblastoma (glioma retinae).** Acta genet. & Stat. med. 7:565-572, 1957.

The genetics of retinoblastoma have by now been elucidated to such an extent that the eugenic consequences for the family as well as for the population may be explained. The author gives a survey of the cases in which parents should be dissuaded from having children and in which a voluntary sterilization seems to be indicated for eugenic reasons. The increase in the number of patients with retinoblastoma, which is to be expected as a consequence of modern therapy, is discussed. (6 references)

Irwin E. Gaynon.

NEWS ITEMS

EDITED BY DONALD J. LYLE, M.D.
411 Oak Street, Cincinnati 19, Ohio

News items should reach the editor by the 10th of the month. For adequate publicity, notice of postgraduate courses and meetings should be received three months in advance.

DEATHS

Dr. Fritz Nelson, Colorado Springs, Colorado, died January 2, 1958, aged 67 years.

ANNOUNCEMENTS

HOME STUDY COURSES

The 1958-1959 Home Study Courses in the basic sciences related to ophthalmology and otolaryngology, offered as a part of the educational program of the American Academy of Ophthalmology and Otolaryngology, will begin on September 1st and continue for a period of 10 months. Detailed information and application forms may be obtained from:

Dr. William L. Benedict
Executive Secretary-Treasurer of the Academy
15 Second Street, S.W.
Rochester, Minnesota.

Registrations should be completed before August 15th.

ORTHOPTIC EXAMINATIONS

The annual examination of orthoptic technicians by the American Orthoptic Council will be conducted in August and October, 1958.

The written examination will be nonassembled and will take place on Thursday, August 21st, in certain assigned cities, and will be proctored by designated ophthalmologists.

The oral and practical examinations will be on Saturday, October 11th, in Chicago just preceding the meeting of the American Academy of Ophthalmology and Otolaryngology.

Application for examination will be received by the office of the Chairman of Examinations:

Dr. Frank D. Costenbader
1605 22nd St., N.W.
Washington 8, D.C.

Applications must be accompanied by the examination fee of $30.00. Applications will not be accepted after July 1, 1958.

EYE PATHOLOGY COURSE

The Department of Ophthalmology, Washington University School of Medicine, Saint Louis, announces a one-week course in eye pathology to be given by Dr. Theodore E. Sanders. The course will begin on July 28, 1958. For further information write.

Department of Ophthalmology
Washington University School of Medicine
640 South Kingshighway
Saint Louis 10, Missouri.

TREACHER COLLINS PRIZE ESSAY

Under the title, Treacher Collins Prize Essay, the council of the Ophthalmological Society of the United Kingdom has instituted a prize of £100, awarded triennially, for the best essay submitted on a subject selected by the council. The prize shall be open to qualified medical practitioners of any nationality. The essay shall be written in English. The subject for the next award of the prize is "The eye in relation to collagen diseases," and the winning essay may be published in the *Transactions of the Ophthalmological Society*, if the council so desires. The closing date for sending essays for this award is December 31, 1959. Submit essays to:

Honorary Secretary
Ophthalmological Society of the United Kingdom
45 Lincoln's Inn Fields
London, W.C. 2.

No name should be on the essay, but a distinguishing pseudonym or quotation, which should be on a sealed envelope containing the candidate's name and address, should accompany the essay.

EYE HISTOPATHOLOGY COURSE

An intensive course in normal ocular histology and histopathology will be given June 2 to 7, 1958, from 2:00 to 6:00 p.m. at the New York Eye and Ear Infirmary by Dr. Bernard Roberts and Dr. Lawrence Samuels of the Department of Ophthalmic Pathology, Dr. Brittain F. Payne, Director. The slides and specimens will be drawn from one of the largest eye collections in the world.

Registration for the course is limited to 15. The fee is $100.00. For further information, write to:

Mrs. Tamar Weber, Registrar
Institute of Ophthalmology of the Americas
New York Eye and Ear Infirmary
218 Second Avenue
New York 3, New York.

POSTGRADUATE COURSES FOR SPECIALISTS

The Institute of Ophthalmology of the Americas of the New York Eye and Ear Infirmary announces a series of postgraduate courses for specialists to be given from November 3, 1958, to January 9, 1959.

Courses will be given in the following subjects: Anomalies of extraocular muscles, including ptosis; aniseikonia; biomicroscopy; cataracts; clinical bacteriology; complications of ophthalmic surgery; electrophysiology of the eye; glaucoma; gonioscopy and tonography; keratectomy and keratoplasty; lacrimal sac surgery; medical ophthalmoscopy; near ultraviolet biomicroscopy; ocular al-

lergy; ocular biochemistry; ocular microbiology; ocular neuro-ophthalmology; ocular photography; ocular radiology; ocular trauma; ophthalmoscopy; pathology; perimetry; plastic eye surgery; pleoptics and macular function testing; psychosomatic factors in ophthalmology; radio-isotopes in ophthalmology; refraction; and retinal detachment.

Further information regarding the courses may be obtained by writing to:

Mrs. Tamar Weber, Registrar
Institute of Ophthalmology of the Americas
New York Eye and Ear Infirmary
218 Second Avenue
New York 3, New York.

Miscellaneous

Eye foundation grants

Grants amounting to $225,000 for eye research were announced by the Knights Templar Eye Foundation, Inc., at the 1957 NSPB membership meeting.

The grant program was made public by Major General Walter A. DeLamater, president of the Foundation, and by George D. Barclay, Grand Commander of Knights Templar of the State of New York.

NSPB president Mason H. Bigelow praised the Knights Templars for taking "one of the most outstanding forward moves in the fight against blindness" in setting up the Eye Foundation. "The research activities stimulated by these unrestricted grants will surely yield useful results," he added.

General DeLamater said the Eye Foundation fund is raised by contributions among the 390,000 members of the Grand Encampment of Knights Templar throughout the United States.

Board of directors

At the annual meeting of the NSPB elections to the board of directors included:

Re-elected for the term of 1958 to 1960 are: Frederick C. Cordes, M.D., Arthur G. De Voe, M.D., Mrs. Edward Forman, Eugene M. Geddes, Everett L. Goar, M.D., Robert F. Irwin, Jr., Peter M. Murray, M.D., R. Townley Paton, M.D., Mrs. Eugene C. Pulliam, John Schuhmacher, Frank H. Woods, and William Ziegler, Jr.

New members elected to the board are Stewart P. Coleman and Algernon B. Reese, M.D., of New York, and John D. Porterfield, M.D., of Washington, D.C.

Societies

Pennsylvania academy

The Pennsylvania Academy of Ophthalmology and Otolaryngology will meet at the Bedford Springs Hotel, Bedford, Pennsylvania on May 22nd, 23rd, and 24th. Speaking on the joint eye, ear, nose, and throat program will be: Edwin F. Tait, Norristown, "Socio-economic problems of ophthalmology," and Robert J. Beitel, Jr., Allentown, "Problems of ancillary workers in ophthalmology and otolaryngology." Moderators for the panel discussion on "Medical economics and you," will be Robert E. Shoemaker, Allentown, and Paul C. Craig, Reading.

On the ophthalmology program is a symposium on "Retinal detachment," with Edward W. Norton, New York, William G. Everett, Pittsburgh, and Ichiro D. Okamura, Boston, on the panel and James S. Shipman, Philadelphia, acting as moderator. Other ophthalmic papers include: "Cerebrovascular lesions of ophthalmic interest," John W. Henderson, Ann Arbor; "Technical problems in detachment surgery," Ichiro D. Okamura and Edward W. Norton; "Selection of surgery in strabismus," Edmund B. Spaeth, Philadelphia; "Differential diagnosis of optic neuropathies," John W. Henderson; "Surgical techniques in strabismus," Edmund B. Spaeth.

United Kingdom society

The Ophthalmological Society of the United Kingdom met at University College of South Wales and Monmouthshire, Cathays Park, Cardiff, on April 17th, 18th, and 19th. Dr. J. J. Healy, president, gave the address of welcome, which was followed by a discussion of "Complications and treatment of hypermature cataract," with Mr. G. T. Willoughby Cashell, Mr. C. A. Cook, and Mr. J. R. Hudson as openers. This was followed by the awarding of the Norman McAlister Gregg Prize on behalf of the Ophthalmological Society of New South Wales to Dr. Maurice E. Langham.

Papers presented were: "Conjunctival fibrosis after filtration operations," Mr. A. Stanworth; "Band keratopathy with a report of a case of Fanconi's syndrome with calcium deposits on the cornea," Mr. S. J. H. Miller; "Combined treatment of retinal detachment," Dr. G. Meyer-Schwickerath; "The effect of neptazane on the intraocular pressure of rabbits and human subjects," Dr. Maurice E. Langham; "A case of rhabdomyosarcoma of the orbit," Mr. P. L. Blaxter.

Speakers for the symposium on "The role of Toxoplasma in ocular disease," were Prof. C. P. Beattie, Dr. J. K. A. Beverley, and Mr. E. S. Perkins. The president, Mr. J. J. Healy, spoke on "Precancerous melanosis of the conjunctiva"; Dr. M. Lederman on "Radiotherapy in cancerous melanosis and precancerous melanosis"; Dr. A. L. Wills, "Precancerous melanosis—a specific entity?"

Other papers presented were: "Radiation damage to the chiasm and hypothalamus," Dr. R. W. Harrington; "Observations on some results of perforating cyclodiathermy," Mr. Arthur Lister; "The modern treatment of chronic uveitis," Mr. A. G. Cross; "A case of anorexia nervosa in a young woman with development of subcapsular cataracts," Mrs. Dorothy Miller; "The McArthur microscope," Dr. John McArthur.

"A method of iris inclusion," Mr. Dermot Pierse; "Trachoma in Jordan and Gambia," Mr. M. J. Gilkes; "The incidence of various types of glaucoma," Mr. Redmond Smith; "The priscol

test in glaucoma," Mr. J. A. E. Primrose; "Lime burns of the external eye," Surg. Cdr. D. P. Gurd; "Retinal capillary circulation," Dr. N. Pines.

Anniversary conference

The 50th anniversary conference of the National Society for the Prevention of Blindness, Inc., was held at the Bellvue-Stratford Hotel, Philadelphia, March 12th through 14th. The address of welcome was given by the president, Mason H. Bigelow. The first discussion was on "The volunteer in prevention of blindness," with Ira V. Hiscock, Department of Public Health, Yale University, acting as chairman. James E. O'Neil, director of Industrial Service, NSPB, was chairman of the second conference on "Vision: Keynote of modern industry."

Other discussions were on "Teaching partially seeing children at various grade levels," Charles C. Wilson, professor of Education and Public Health, Yale University, chairman; "Value of professional co-operation in eye patient care: A panel discussion of a glaucoma problem," Mrs. Marcella C. Goldberg, Pittsburgh, moderator; "Public relations for local prevention of blindness work," James L. MacWithey, New York, chairman.

Francis Heed Adler, Philadelphia, served as chairman of the panel on "Reports of scientific progress," and papers were presented by I. S. Tassmann, Philadelphia, "Diabetic and vacular retinopathies"; A. E. Maumenee, Baltimore, "Medical management of primary glaucoma"; Wilfred E. Fry, Philadelphia, "Surgical management of primary glaucoma"; Edmund B. Spaeth, Philadelphia, "Congenital cataracts"; Bernard C. Gettes, Philadelphia, "Optical aids for persons with low vision."

American Goiter Association

The American Goiter Association will hold its 1958 meeting at the St. Francis Hotel, San Francisco, on June 17th, 18th, and 19th. Hotel reservations, which must be accompanied by a deposit of $10.00 per room, may be obtained by writing:

Goiter Housing Bureau
Room 300
61 Grove Street
San Francisco, California.

The program for the three-day meeting will consist of papers and discussions dealing with the physiology and diseases of the thyroid gland.

Change of address

Since April 25th, the Illinois Society for the Prevention of Blindness has been located in new headquarters at 20 West Jackson Boulevard, in Chicago. The society's new telephone number is WAbash 2-8710. The move also involves the Illinois Eye-Bank, a project of the Illinois Society for the Prevention of Blindness. The Illinois Eye-Bank is a 24-hour, around-the-clock emergency service.

Personals

Dr. Benjamin Friedman has been appointed professor and director of the Department of Ophthalmology at the New York Medical College, Flower and Fifth Avenue Hospitals.

Prof. Moacyr E. Alvaro, head of the Department of Ophthalmology of the Paulista School of Medicine, was guest lecturer at the Faculdade de Sciencias Medicas of Rio de Janeiro, where he gave the inaugural class for 1958.

Prof. Ivo Gorrea Meyes, head of the Department of Ophthalmology of the Porto Alegre Medical School, was a guest speaker at the Escola Paulista de Medicina, where he gave the inaugural class for 1958.

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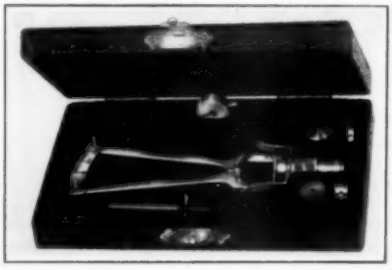

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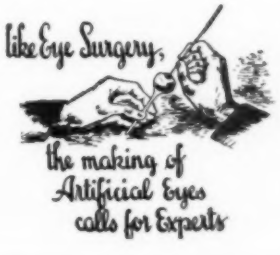

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